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The Pedagogical Significance of the Computer-Student Relation

by

Norman Friesen

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements for the degree of Doctor of Philosophy

Department of Secondary Education

Edmonton, Alberta

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled The Pedagogical Significance of the Computer-Student Relation submitted by Norman Friesen in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

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APRIL 30, 2003

Dedication

I lovingly dedicate this dissertation to my wife, Barbara Simler. Without her strength, support and affection, this work simply would not have been possible. This dissertation is also dedicated to friends, family and colleagues who all made invaluable, if sometimes unwitting contributions to it. These individuals include Terry Anderson, Mary Elizabeth Leighton, Rory McGreal, Liam Rourke, Dan and Gosia Schellenberg, Jan Schroeder, and Chris Wiebe. This dissertation is also dedicated to the memory of my father John Friesen and my bother, Murray. Special thanks are also due to my advisor, Max van Manen, whose unfailing help and advice, often generously provided on evenings and weekends, never failed to significantly motivate and direct my research and writing. Thanks are also due to the Killiam Foundation, the Canadian Social Sciences and Humanities Research Council, and the University of Alberta Endowment for the Andrew Stewart Memorial Graduate Prize for their generous financial assistance. Finally, I would like to thank the Department of Secondary Education, which has always been an affirmative and accommodating environment for my questions and my research.

Abstract

New computer and Internet technologies are commonly believed to hold great promise for higher education. But quantitative measures of efficiency, and cognitive understandings of these technologies have produced inconclusive results--especially as these technologies are compared to more conventional educational forms. In a field dominated by technical and computational understandings, this dissertation uses the methodologies of human sciences to inquire into the human ends these technologies ultimately are to serve.

This dissertation employs a qualitative, hermeneutic-phenomenological method of inquiry that is relatively unfamiliar in educational technology research. This methodology understands the computer as opening up spaces of existence or "worlds" to its user in much the same way as a novel opens up an imaginary world to its reader. It focuses on computer-mediated communication and human-computer interaction, comparing these activities to the forms of face-to-face classrooms.

The types of experiential worlds opened up by these activities, as well as the experiential dimensions they present, structure the main chapters of the dissertation. Chapter one presents an introduction and overview of issues as they are discussed in the literature of educational technology. Chapter two contrasts the human sciences methodology utilized in this dissertation with the scientific understandings that are so effectively instantiated in computer technologies. In chapter three, the worlds to which computers give rise are described in terms of their co-emergence with language that deeply affects how we think about computers and education. Chapter

four continues with a critical examination of this language, undertakes an extended investigation of human-computer interaction, and studies the ways we act in these worlds in terms of body, time, space and relation. Chapter five employs these same analytic terms to further examine the experiential world opened up through computer networks. This chapter also focuses on computer mediated communication, as exemplified in what are often called online discussion forums. The sixth chapter offers a sustained reflection on the themes and issues emerging from the experiential analyses in the previous three chapters. The dissertation concludes by summarizing its findings, and presenting a number of suggestions for further research and for practice.

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Introduction - Setting Up the Question

Parallel Universes - Virtual and Physical

"You've got mail!" A message box pops up and my computer chimes softly. A quick glance shows that it's from an old friend who also happens to be in an online class I'm taking. It seems a bit impersonal and vague, but I click on the reply button and type a cheery greeting. I tell my friend that I enjoy taking the class with her but that I'm finding the subject matter kind of boring--and that I'll be glad when the semester is over. Later in the day, I check my email again, and am surprised to see that I have received a message from myself. I click on it only to see that it is the message I earlier sent to my friend. I feel an embarrassed blush as I realize what I have done: I've sent the message to everyone in the class, including the instructor! The message that I originally replied to was actually one that my friend sent to our class email list! (Nandini, English student)*

"Hey, Paul; thanks!" My friend holds the elevator doors as I wheel in a cart carrying an overhead projector. I ask him to press the third floor for me. "Are you all ready for your presentation?" he asks. "Well, I've still got 15 minutes to prepare," I respond; "We'll see if I'm ready when class begins." I look nervously at my watch, and start to add: "Actually, I can't wait until the semester is over; I'm finding the whole course kind of bor. . ." But in mid-

---

* Note: Narrative experiential accounts are presented in this dissertation using a sans-serif font. Those accounts specifically describing *virtual experiences* are italicized to differentiate them from descriptions of face-to-face encounters.

sentence, the elevator doors open and our professor steps into the elevator! I'm not sure if he heard what I just said, but I realize I must be blushing, because he smiles faintly and reassures me: "I'm looking forward to your presentation, James. I'm sure it will help pick up the pace and give us something to think about!" (James, Education student)

* * *

I've finally tracked down the Web document that I had come across earlier. It's a lengthy essay on the same topic as a paper I'm writing. Clicking on the link that should lead to it, my computer pauses. After a few moments, a screen appears telling me that "The page cannot be displayed" (see figure 1). I don't bother to read the numerous explanations that are provided beneath this dire notice. Instead, I impatiently click on my browser's "refresh" button to try to reload it. Thankfully, the document appears! Scrolling quickly up and down, I see that it is quite long. I print it out, staple it together, and begin to read. (Susan, researcher)

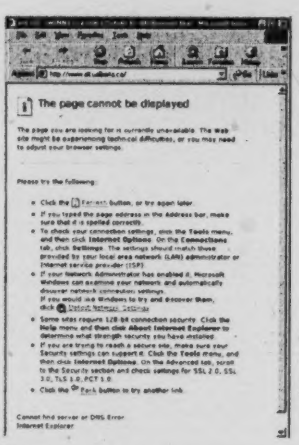

Figure 1: The page cannot be displayed

I pull the book off the shelf and check the table of contents to locate the chapter I've been looking for. I flip to the appropriate page number, and realize that I've skimmed through this part of the book some months ago. On the next page, I come across a passage that I had highlighted earlier. I press gently on the spine of the book as I re-read the passage closely. . . . (Muwali, Sociology student)

* * *

As I click on the names in the listing of messages, I am struck by the eloquence with which these messages are written: "The creatures in our woods are preparing for winter. Outside the window next to my computer, I see the birds gathering around our bird-feeder. . ." This is apparently written by a woman named Maria from Wisconsin. From Manchester, England, someone named Lorna says, "Autumn is my favorite season because it holds a deep secret that I hope to unravel. . . ." And from Hong Kong, James Wong writes "The persistent heat of summer is slowly dissipating, and the rhythms of the city are becoming more even and measured. . .."

These messages continue in the way they begin: Beautiful, well-written, and evocative. But I find myself wondering: "Who are these people? How can they be so eloquent, without even trying, it seems? How do they come up with such beautiful descriptions?" (Andrew, graduate student)

The introductions in the small seminar class continue as we go around the table: "Hi, my name is Mandy. I've been in the Master's program in elementary education for over 2 years, studying part-time. I've greatly enjoyed it and found it challenging. Many of the lessons I've learned have already helped me in my professional life, and I'm looking forward to learning even more. Over the last 18 months, though, I've been facing many personal challenges, especially with the recent death of my husband from cancer. But I've found great support among my classmates and the faculty in the department." People nod and smile, but I gulp as I feel some discomfort

rising over me. I know I feel ill-at-ease with engaging in this kind of self-disclosure myself, especially in front of so many people. At the same time, I admire this woman for her courage and openness, and I wonder what I could say to reciprocate her honesty and courage in some small way. (Sara, graduate student)

* * *

I click on a link in my online course syllabus, and a small browser window pops open revealing what is labeled a "ball drop applet: http://webphysics.davidson.edu/Applets/Galton/BallDrop.html." As soon as it is visible, little yellow balls begin falling from the top, and start silently bouncing and jiggling between green pins on their way to the bottom--often moving as much to the left or right as they move downwards. As I watch with some fascination, they pile up at the bottom, in a pattern that I assume is supposed to follow the bell curve at the bottom of the applet window. I read as the balls continue to fall:

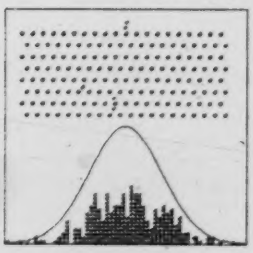

Figure 2: Ball drop applet

> *This applet illustrates a process that gives rise to the familiar "bell curve" of the normal distribution. The normal (or Gaussian) distribution is one of the most commonly observed and is the starting point for modeling many natural processes. . .*

(Michael, science major)

"Okay. To demonstrate the principles of probability and distribution, I'm asking you to divide into groups of three. Since there are about sixty in the class, this should make for about 20 groups. Each group is responsible to flip a coin--any coin that you might have in your pocket--ten times, and to record the results." I get together with a couple of people who have been sitting beside and getting to know slightly during the last couple of classes. As they gather around, I start to flip a coin, slapping it on the back of my hand to reveal heads or tails. Each time I flip the coin, it comes up heads: six times, seven times, eight times. Curiosity starts turning into surprise and even disbelief. But on the tenth trial, I feel a sense of disappointment as it comes up "tails." Just at this moment, the teacher places a transparency on the overhead projector, and announces from the front: "I know that at least one of you will have come up with nine or even ten heads or tails." He point to the left and right extremes on the graph to indicate where an outcome such as ours would fall. But most will be somewhere in the middle. Laws of probability make any other outcome quite unlikely." (Alex, science student)

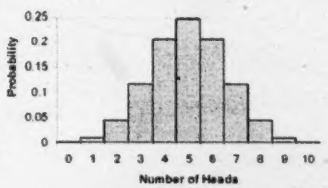

Figure 3: Probability and distribution

The Difference that Makes a Difference

Since the popular advent of the Internet and the World Wide Web in the 1990s, expectations and predictions about the significance of these technologies for education have varied widely. Some have seen the Internet as precipitating a revolution that will vastly improve access and quality (Irvine, 2001); others have

been led to predict the end--the complete commoditization--of public education (Noble, 2001). In either case, the paragraphs provided above illustrate ways in which these technologies are becoming everyday experiential realities in public education--and often not in the ways predicted: Courses taught in the classroom are frequently augmented by online components. One article in the *Manchester Guardian* estimates that "about 20% of study in British Universities is now e-learning--students downloading materials, taking part in online discussions or assessments" (*Guardian Weekly*, 2003, p. 23). School reforms in the United States and Canada have insisted on the integration of computer technologies into the curriculum (e.g. Cuban, 2001; Flanagan, 2002), and computers and computer labs have become familiar fixtures in classrooms, schools and institutions of higher learning. Finally, despite the failure of many dot-com-era "virtual universities" (Terry, 2002; Press & Washburn, 2001), enrollment in distance education institutions--and in online courses offered by more traditional institutions--has been increasing considerably. For example, Athabasca University, advertising itself as "Canada's Open University," has reported a 76% increase in overall student numbers between the period 1997-2002 (Athabasca University, 2002). Large scale versions of these distance institutions have been serving hundreds of thousands of students in countries such as Thailand and China (Daniel, 1998). For many of these students, the reality of an online course or discussion might well be more familiar than that of its physical, classroom equivalent.

In the context of these changes, Internet and computer technologies are often seen to be neutral ground. Neutral in what sense? Neutral for education, pedagogically

neutral. As far as educational purposes are concerned, it should not matter whether learning takes place in a physical reality of bodies, mortar and bricks, or in a "virtual" reality of words, interfaces, and "clicks." The four pairs of parallel educational situations provided above illustrate this assertion. Whether you exchange opinions about class by email or in the elevator, you risk the chance of mis-communicating or being overheard in either context. It should not matter whether students in a class are introduced to one another physically or online. They can get to know each other in either context. It should not matter whether you use a Web document or a printed book for research: there are ways of delivering the same information effectively in either format. Finally, it should not matter whether principles of probability and distribution are learned via a simulation or flipping of a real coin: either way, you should be able to arrive at the same results. But is this true? Are educational experiences indifferent to the reality or "virtuality" of the environments in which they arise?

Research comparing the effectiveness of technology-based courses versus those taught in the classroom has repeatedly shown that there is "no significant difference" between the two. In The "no significant difference phenomenon" (1999, 2002), Thomas Russell looks at over 350 studies conducted over 75 years, that consistently arrive at this same conclusion. From print-based correspondence to courses taught via radio, television and the Web, the use of such technologies was in each case not found to make a statistically significant difference. When compared with student performance in more traditional classroom settings, any differences detected fall within acceptable margins of error or statistical insignificance. As one recent report

cited by Russell states, "no significant differences were found in outcomes for students in the two modes of instruction" (2002).

However, I will argue and show that there *are* significant differences between these two types of contexts for teaching and learning. And these differences are registered most clearly in *experiential* terms: The experience of receiving a mis-directed email message in a class mailing list is quite different from overhearing a conversation in an elevator or hallway. Coming across a text online is different from taking a book off the shelf and perusing it. Meeting classmates in an online discussion forum is different from introductions in a conventional classroom.

But what exactly are the differences that make a real difference for education? How can their pedagogical relevance be understood or expressed? Frames of reference provided by "outcomes" or measures of "instructional effectiveness" do not seem to provide answers to these questions. But as technologies continue to encroach and change the way we experience our everyday lives, we cannot continue to remain ignorant of such differences. We need ways of answering these and other questions in order to come to a fuller understanding of teaching and learning in these new online, digital contexts. But what terms and methods of inquiry should we use? How can the question be asked in such a way that it gets at the significant differences between virtual and real educational forms?

Hans-Georg Gadamer claims that "the essence of the *question* is to open up possibilities and keep them open" (1989, p. 299; emphasis in original). A question, in

other words, should not be framed or articulated in such a way that it unnecessarily forecloses on certain answers, or so that it already contains or points to a predetermined answer: "the openness of what is in question consists in the fact that the answer is not settled," Gadamer explains (1989, p. 363). It is precisely the aim of this chapter to formulate or set up this kind of open, "unsettled," and perhaps unsettling question.

To construct such a question, it is important to look more closely at the way the significance of computers and networked technologies are generally understood in the literature of educational technology: What are the explicit issues that are brought to the fore, and what kind language is used to identify them? What common meanings and themes might underlie these issues and link them together? How can meanings and themes be understood in order to formulate a question that gets at differences heretofore ignored?

Technology: Tutor, Tutee, Tool, and Medium

In overviews of the literature of educational technology, it is generally observed that computers have played three distinct functions or roles in educational contexts. The introductory text, Computers in Education, suggests "that all educational applications of computers can be placed into one of three major classifications: tutor, tool, or tutee. In this categorization scheme" the text continues, ". . . the computer takes on three different roles. It serves either as a tutor (i.e., teacher), as a handy tool, or as a tutee, (i.e., student)" (Merrill et al, 1996, p. 11; see also Taylor, 1980; Jonassen & Reeves, 1996).

Understandings of the educational significance or role of the computer in education specifically as "tutor" or "teacher" have been of special importance early in the history of educational computing. Such understandings are illustrated in computer applications such as drill and practice exercises, games and simulations. Merrill et al explain:

> In tutor applications, the computer acts as a tutor by performing a teaching role. In effect, the student is tutored by the computer. These types of applications are often referred to by several different labels such as computer-based instruction (CBI), computer-assisted instruction (CAI), or computer-assisted learning (CAL). The general process is as follows:
>
> 1. The computer presents some information.
> 2. The student is asked to respond to a question or problem related to the information.
> 3. The computer evaluates the student's response according to the specified criteria.
> 4. The computer determines what to do next on the basis of its evaluation of the response. (1996, p. 11)

The second way of understanding the significance of the computer in education is to compare its role with that of the student or "tutee." This approach is closely associated with Seymour Papert's work with the LOGO programming language in the late 1970's and early 1980's. LOGO is a "simplified" or "friendly" language most

often used to formulate "geometric commands. . . to draw objects on the [computer] screen" (Jonassen & Reeves, 1996, p. 699). Papert has understood this programming language as having revolutionary potential for education. He claimed it opened the possibility of reversing the existing, conventional relationship between children and computers--one in which the child is merely led or "programmed" by the computer:

> In the LOGO environment [this] relationship is reversed. The child, even in preschool ages, is in control: The child programs the computer. And in teaching the computer how to think, children embark on an exploration of how they themselves think. (1980, p. 19)

The student becomes a tutor, and the computer plays the role of a "tutee." In this role, the computer serves to "concretize (and personalize) the formal"--to make tangible and manipulable abstract rules and principles in subjects such as mathematics and geometry (Papert, 1980, p. 21).

The third way of understanding the educational significance of the computer is to see it as playing the role of a tool in learning: "In tool applications, the computer is an instructional tool similar to a pencil, typewriter, microscope, slide rule, piano, or drafting table" (Merrill et al, 1996, p. 13). This understanding is readily suggested and reinforced by the way that the operation and use of computers is understood generally. According to this understanding, the relation between the user and the computer is often cast in terms that are above all mechanical, instrumental and productive. For example, the person engaged with a computer is not simply a

student; he or she is always also a *user*. Such a user, moreover, is said to be "interacting" with one or more "applications" or "productivity tools" which are in turn "executed" with the help of an "operating system."

The idea of the computer playing the role of a "tool"--more specifically, of a "cognitive tool" or a "mindtool"--has recently received much attention among those associated with constructivist approaches to educational technology. Along with other technologies, the computer is described as an instrument that can enter into a fruitful and intimate "collaboration" or "partnership" with the student. Such an understanding is most prominently represented by David Jonassen:

> Cognitive tools. . . are computational devices that can support, guide, and extend the thinking processes of their users. . . . Computers and videoplayers are knowledge construction tools that engage learners in critical thinking about what they are learning. . . .Learners and technologies should be intellectual partners in the learning process. . . learners contribute what they do best and technologies contribute what they do best--the learner is in charge. (Jonassen, Peck & Wilson, 1999, pp. 14, 13)

Jonassen illustrates how this type of learner control can be exercised in a variety of kinds of engagement with computers and the Internet. The kinds of software systems and utilities that he considers as mindtools include databases, expert systems, Web search engines, and simple multimedia and interactive programming systems (Jonassen, 1999; 2000).

There is a fourth role often associated with computers in education that is not covered by the terms "tutor," "tutee" and "tool." This is a role that has come to prominence along with the Internet in the 1990s. In it, the computer takes on the characteristics of a communications technology or of a *medium*. As the term "medium" itself implies, computers and the Internet can serve as a "middle term" in connecting the student with information, and with other people. Linda Harasim (1993) explains the origins of the computer as a medium:

> The fusion of computers and telecommunications over the past twenty years has created a worldwide web of computer networks; these networks, initially established for transferring data, have been adopted by people who want to communicate with other people. Human communication has become the major use of computer networks and has transformed them into a social space where people connect with one another. . . . [These spaces] enable people to socialize, work, and learn based on who they are rather than where they are located. People have more choice. (pp. 15, 22)

The Hidden Curriculum: Relationship and Control

Describing the computer and Internet as a medium, a mindtool, a tutee or a tutor reveals the manifold and varied ways in which the educational potential or significance of computers and Internet can be understood. But underlying this multiplicity are two common themes that reappear consistently and repeatedly in the literature, but are rarely considered explicitly in it: One is *relationship*; and the

other, *control*. These form a sort of "hidden curriculum" that underlies, shapes and motivates many discussions and understandings of educational technology.

In each description of the four roles of the computer and Internet in education cited above, this role or value is envisioned as being realized specifically in the context of a *relationship*. This relationship, moreover, is most often portrayed as a close or intimate one-on-one affiliation. Students and computers enter into relationships that are compared to those that develop between a teacher and a student, a tutor and a student, or a student and a peer, partner or interlocutor. Computer technology is seen as entering into a relationship with the student by playing a particular, personal role--a role in which it is ascribed broadly human and personal characteristics. The computer relates to the student by "performing a teaching role" (Merrill et al, 1996, p. 11); the student teaches the computer "how [to] think" (Papert, 1980, p. 19); the computer and student share the work of learning in a "collaboration" or "partnership" (Jonassen, Peck & Wilson, 1999, p. 13); or finally, the computer creates a space that enables the development of relationships--"connect[ing] people with other people" (Harasim, 1993, p. 3).

Educational applications of computers and the Internet are thus clearly marked by their emphasis on *relationship*. Educational applications of these seem to be emphatically, typically or perhaps ideally situated in the context of a close or one-on-one relationship with the student, in which reciprocal roles are clearly and conventionally defined. Put another way, it seems that the educational value or role

of the computer is best described, understood or realized in the context of an intense, one-on-one relationship.

But the striking commonalities do not end here. In each of the four characterizations cited above, the relation of student and computer is also clearly described in terms of *control*--and it is usually emphasized that it is the student who is or should be firmly in control: When considered as a tutor, the computer is described as controlling or leading the student--guiding her through a sequence of questions and answers, or stimuli and responses. Papert, Jonassen and Harasim, however, all subsequently emphasize that it is the *student* who should be "in control" or "in charge" (Papert, 1980, p. 19; Jonassen, Peck & Wilson, 1999, p. 13; Harasim, 1993, p. 22). Papert and Jonassen are especially explicit in their claim that these technologies allow the student to move from a relationship where he or she is supposedly being "controlled," "programmed" or "guided" to one in which the student is supposed to be able to "guide" or "control" the computer (Jonassen, Peck & Wilson, 1999, pp. 14, 13; Papert, 1980, p. 19).

The recurrence of the themes of control, guidance, and relationship are certainly not limited to the passages cited above. They resurface again and again in literature and discussions that consider technology and pedagogy. Another example is provided by theories of distance education. One of the early theorists in this area, Börje Holmberg, identifies "the fundamental idea underlying distance education" as a "guided didactic conversation" (as cited in Moore & Kearsley, 1996, p. 202). Holmberg understands such a conversation as being part of "a personal relation

between the teaching and learning parties" (Holmberg, 1995, p. 47). This conversational relation can be simulated through the student's interaction with teaching materials to take the form of an "internal didactic conversation" (Moore & Kearsley, 1996, p. 202). The degree of structure in this figurative dialogue is seen as a direct, contributing factor to what has subsequently been identified as "learner autonomy." As Moore and Kearsley characterize it, learner autonomy describes the learner's capacity to "construct and control. . . the learning process" (1996, p. 205).

Control, autonomy, and a guiding conversation or intimate relation between teacher and learner: These and other themes lie hidden beneath the surface of the literature on educational technology. Such themes are frequently used to situate and justify more overt concerns and positions. They seem to constitute an agenda or curriculum hidden behind terms more technical terms such as "tool," "transaction," "mediation," "productivity" or "application."

What is the nature of this hidden curriculum? What are the dimensions and implications of these "subterranean" themes? The theme of relationship is described in terms of roles: tutor, tutee, partner, medium; it is intimate and conversational, and one in which "guiding" occurs (at least as Holmberg and Jonassen describe it). But who is actually in control in this relationship? How can there be guiding when the student--the one learning and supposedly in need of guidance--is supposed to be in control?

To set up a concise and open question about the relevance of such technologies for education, it is important to capture the underlying themes of relationships, roles and issues of control and guidance invoked so consistently in the literature. For this purpose, I will use the term "pedagogy" to connote notions of control, autonomy, and a guiding conversation or relation between teacher and learner. The Morris Dictionary of Word and Phrase defines pedagogy by saying that "the word comes from the Greek *pais, paidos* (child) and *agein* (to lead). The *paidagogus* of ancient Greece was a slave whose responsibility it was to accompany the master's son. . ." (1977, pp. 446, 447).

Specifically, it was the task of the slave or "pedagogue" to lead the son to the agora, to school. The pedagogue, in other words, is a slave whose role it is to guide to a place of learning. But the pedagogue guides, controls, and leads, however, only insofar as he is a slave, only insofar as such guiding is required by his role. This guidance and control is the result of an ability or power that is not possessed directly by the slave, but conferred upon him in the confines of his role. This complex ambivalence is further underscored by the rich and varied ways in which *agein*--to lead--is used in the Greek. In different contexts, the Greek term refers to the carrying of cargo, to leading by means of reins or a leash, and to drawing out, fetching, bringing or escorting (Liddell & Scott, 1968, pp. 17, 18).

In studying the educational relationship between student and computer, I will use the term "pedagogy" to invoke the roles and ambivalence of control and guidance described above. I will inquire into the relationship between student and computer,

understanding it in terms of a relation that involves guiding, and can have a conversational or dialogical character. In this context, I will ask about the degree to which it actually resembles a "guided didactic conversation," or rather, the degree to which it is *pedagogical*.

The Computer and Network as Worlds

What of the computer and networked technologies themselves? How does the computer figure in this relation? In trying to set up an open and possibly unsettling question, it is important to not simply just assume that the student relates to it as another person, or as an educationally-neutral tool that might increase productivity.

In addition, as the terms are used here, "computers" and "networks" are not understood as applying to simply *any* networked and computational devices. These words are not seen as designating a computer that may be, for example, embedded in a portable phone. It does not refer to the computer that regulates the functioning of the engine in a car, or that is used to operate an airplane or a furnace.

As it is considered in this dissertation, the computer is an artifact that sits on desktops or on laptops, and is found in classrooms, libraries and computer labs--as it has from the mid 1990's to the writing of this dissertation. The "network" refers to the Internet and World Wide Web, and to the different things they can be used to accomplish. Understood in this way, both the Internet and computers will no doubt change their form as technologies and their applications evolve and develop. At the same time, the computer and the network in these forms have been reasonably stable

in their characteristics for quite some time, and have outlasted many predictions of their demise.

Regardless of their precise form, computers and the network are obviously manifestations of technology. In his early work, Martin Heidegger describes technology in terms of a "totality" or "ensemble." Any one piece of technology or equipment, Heidegger explains, necessarily belongs to the "totality of equipment" in which it is used (1962, pp. 97-98). In his later writing, Heidegger characterizes technology and the totality in which it is manifest more broadly by using the German word "*Gestell*." This term has been translated or interpreted variously as an "enframing," "installation," "emplacement" or even a "set-up" (Weber & Cholodenko, 1996). In a commentary on Heidegger's The Question of Technology, Samuel Weber explains his interpretive choice of the word "emplacement" for the German "*Gestell*" as follows:

> it signifies not so much the setting up of an apparatus as the set-up *tout court*, "the assigning or appointing of a definite place" (Webster's). What is at stake is the not the placing of something, but the staking out of place as such. . . . The notion of emplacement. . . collects and assembles the various ways in which everything, human beings included, is 'cornered' (*gestellt*) and set in place. (Weber & Cholodenko, 1996, pp. 71, 72)

Heidegger explains that through this kind of emplacement, "nature reports itself in some way or other that is identifiable through calculation. . . it remains orderable as

a system of information" (1976, p. 304). Emplacement, in other words, orders, identifies and summons: it brings certain things together, and it keeps others apart.

Similarly, Internet and computer technologies cannot be properly understood in abstract isolation from other technologies and their use. Any engagement with these technologies necessarily invokes a whole "ensemble" of related technologies, practices, and ways of thinking. Effective use of the Internet, as a simple example, requires computer and telecommunications equipment, typing ability, a minimum level of troubleshooting and problem-solving skills, as well as a range of other technologies and abilities. It requires the user to manipulate a graphical interface presented through a computer screen using a keyboard and a mouse, but at the same time, it can open up possibilities of imagination and knowledge.

As such, computer and Internet technologies can be understood as opening up or "setting up" certain experiential opportunities or worlds, while "staking out" limitations on others; as making certain experiences, practices and meanings possible, while reducing the significance, purpose and practicality of others.

The computer, in other words, is something that opens up and defines the limits of a world or of worlds. Heidegger speaks of existence itself as giving rise to what he calls the "*worldhood* of the world" (1962, p. 119, emphasis in the original). Speaking of "world" in a sense close to Heidegger's, Gadamer emphasizes that the worlds of our experience and of language are co-emergent:

> Language is not just one of man's possessions in the world; rather, on it depends the fact that man has a world at all. The world as world exists for man as for no other creature that is in the world. But this world is verbal in nature. (1962, p. 443)

However, the notion of the computer as manifesting this "worldhood"--as opening up a world or worlds to those engaged with them--is rarely mentioned in the literature of educational technologies, or even of human-computer interaction. In one exceptional instance, John Walker argues that the general notion of the "worldhood" of the computer has been displaced by an understanding of "conversation" between the computer and its user--a fact that he claims has had unfortunate consequences both for design and use:

> I believe that conversation is the wrong model for dealing with a computer--a model which misleads inexperienced users and invites even experienced software designers to build hard-to-use systems. When you're interacting with a computer, you are not conversing with another person. You are exploring another world. (1994)

In another exceptional passage, Terry Winograd also describes the computer as opening up "a space of existence" (1996, p. xvi); and he characterizes this space as containing "virtual objects," such as "windows, icons, folders and the like" (1996, p. xvii). Winograd further explains that "although these virtual objects are loosely grounded in analogies with the physical world, they exist in a unique world of their

own" (1996, p. xvii). Taken together with Gadamer's characterization of "world" and "language" as co-emergent, it is possible to say that the world opened up by the computer and networked technology has a particular language that arises with it. And this language, furthermore, is one of analogies and metaphors; it is a language that is broadly figurative in nature. Windows, icons, and folders are examples of metaphors and representations applied to computer operations. But these virtual windows, icons and folders are quite different from their counterparts in the physical world. This is also the case with the metaphors and representations used to identify and describe specifically *educational* applications of computers and networked technologies. Web-based discussions, online classrooms, virtual campuses, simulated laboratory exercises. These and other terms appeal broadly to very familiar, everyday phenomena such as classrooms, discussions and exercises. However, these terms are also used to designate online experiences that are qualitatively different from their physical counterparts.

The computer also opens up a space, as Winograd indicates (1996, pp. xvi-xvii), in which we encounter objects that we can manipulate and with which we can interact. In pedagogical contexts, these objects can include simulations, libraries of texts and hypertexts, tests and quizzes and much more. In most cases, we can act upon these objects; and many, in turn, act upon us--providing "feedback" and "output" of various sorts, through dialogue boxes, confirmation and error messages, and more.

Finally, the computer also opens up a world where we encounter and come to know others. This is indicated in descriptions—provided by Harasim and others--of the

role of computers and networks as a medium that connects people. But this world is slightly different than the term "medium" might suggest: It is not a bridge or a neutral conduit through which individuals connect in ways similar to how they would otherwise. It is one in which people represent themselves and are represented in terms that can be very different from those used in un-mediated contexts.

So the purpose of this dissertation is to investigate the question of what is possible, what becomes difficult, and what is perhaps no longer possible or appropriate in the context of set-ups that computers and network technologies imply. I will focus on three aspects or dimensions of the world that is set up or instantiated through this technology: a world that is co-emergent with a particular figurative language; a world in which students are able to act, and which acts upon them; and finally, a world in which students encounter other individuals. I will examine the experiential dimensions of this world in terms of the relationship between computer and student. I will ask how the pedagogical significance of this relationship is or is not realized in these set-ups. I will ask, in other words, whether the "set-ups" of computers and technology "stake out" or "enframe" places that are suitable for pedagogy; where pedagogical roles can be realized, and where pedagogical relations can flourish.

My intention, in short, is to question the "set-up" of computer and Internet technologies in education. And one of the most important ways to begin doing so is to set up an open and unsettled question--a question which can now be formulated as follows:

"What is the pedagogical significance of the relation between students and networked technology?"

Ghost in the Machine: *Geisteswissenschaften* and Digital Technologies

Human versus Physical Sciences

This study is motivated by the question of "the pedagogical significance of the relationship between students and computer technology." In its attempt to answer this question, this investigation will make use of a human science research methodology that is perhaps best characterized as an "eclectic phenomenology of practice" (van Manen, 2001). By using this methodology, I hope to highlight significant differences that are introduced by the use of these technologies, and that are easily ignored by quantitative measures of learning outcomes and efficiency. Such an eclectic phenomenology of practice borrows from and combines elements from a variety of sources. These include the philosophical tradition of phenomenology itself, texts on the application of this philosophy as a research method, and sources from other areas in the human sciences, such as hermeneutics.

"Human science" is a translation of the German "*Geisteswissenschaft*," a term that combines two words that each carry multiple and complex meanings. "*Wissenschaft*" is often translated as "science," but it can actually refer to any area of research or study. "*Geisteswissenschaften*" is consequently sometimes translated as "humanities" or "arts subjects," but it refers to a way of understanding these subjects that is ultimately different from the way they are understood in North American contexts. "*Geist*" in German can be translated as both mind and spirit, and carries many of the

senses these two words possess in English, including the meaning "ghost" (whence the term "Poltergeist"). This ambivalence is captured wonderfully in the use of the term "ghost" in the phrase "ghost in the machine." Coined by Gilbert Ryle in The Concept of Mind, this phrase refers to the "dogma" or common belief that mind and matter are two separate and mutually exclusive categories: The "workings" of the human mind are like a "ghost mysteriously ensconced in a machine." This figurative machine is constituted by "physical processes" of the human body, and it is inhabited by a mind with its own, less obviously physical substance and processes (Ryle, 1949, p. 21).

It is a similar opposition between the "ghostly," mental and human on the one hand, and the material, mechanical, and scientific on the other that I wish to explore in this chapter. For phenomenology finds one of its philosophical starting points in an affirmation of the human and the experiential. And it also begins with a rejection of the primacy and universality of abstract, scientific and materially-based explanation. At the same time, computers have come to present the very materialization and instantiation of precisely these abstract, scientific, and mechanical understandings. So it is the point of contact between the human "ghost" and the computational "machine" that is at the center of this chapter--and indeed, of this dissertation as a whole.

Phenomenologist Maurice Merleau-Ponty explains his understanding of this tension between the scientific and the humanistic as follows:

> I am not the outcome or the meeting-point of numerous causal agencies which determine my bodily or psychological make-up. I cannot conceive myself as nothing but a bit of the world, a mere object of biological, psychological or sociological investigation. I cannot shut myself up within the realm of science. All my knowledge of the world, even my scientific knowledge, is gained from my own particular point of view, or from some experience of the world without which the symbols of science would be meaningless. The whole universe of science is built upon the world as directly experienced, and if we want to subject science itself to rigorous scrutiny and arrive at a precise assessment of its meaning and scope, we must begin by reawakening the basic experience of the world of which science is a second-order experience. (1962, p. viii)

In the place of scientific theory, Merleau-Ponty--and phenomenology in general--insists on the primacy of sensory experience, of direct intercourse with the world and with the meanings and significance that arise with this experience.

Computer science, on the other hand, necessarily understands the computer in terms of the "numerous causal agencies" that constitute its components and operation. It sees experience as secondary to the scientific and logical theories that strictly govern computer operations. As David Bolter describes explains,

> Computer mathematics itself could be defined in terms of the science of symbolic logic, a science that had been developed by generations of

> philosophers in the nineteenth and twentieth centuries. . . . In the computer, then, symbolic logic has achieved what it [otherwise] could not. . . it has become the foundation of computerized mathematics. But to win this end, logic had to condescend to become concrete, to clothe itself in a mantle of free-flowing electrons and to preside over an equally concrete form of mathematics. . . .the digital computer has this virtue: its design is perfectly logical down to the scale of electrons; it has conquered the disorder of the natural world by the hierarchical principles of symbolic logic. (1984, pp. 67, 71, 74)

Computers, then, represent the concretization of abstract rules and principles of logic and science: a "tower of mutually constituted abstractions," as Paul Dourish describes it, one that continues "right down to the abstractions of binary logic that we use to isolate ourselves from the messy world of continuous voltages and variable current" (2001, pp. 81-82). Phenomenology, on the other hand, sees these rules and principles as obscuring a potential "basic experience" of the concrete world that phenomenology itself hopes to re-awaken.

The Reduction as Method

To achieve this re-awakening, phenomenology requires an explicit effort of resistance to abstraction and explanation. This resistance takes the form of a process, or rather, an attitude or orientation that goes by the name of "bracketing" or "reduction." As Max van Manen explains in an online hyper-text on this

methodology, phenomenology requires that the researcher "bracket all knowledge, all theory or theoretical meaning, [even] all belief in what is real..." (2001).

An important example of understandings that need to be bracketed in this dissertation are presented by theories of learning and thought themselves. For it is often the case that in discussions of educational technology, these phenomena are unquestioningly understood in terms derived directly from the operation of computers and computer networks: in the language of cognitive science, discussion or conversation is frequently theorized in terms of information transmission (Krendl, et al, 1996); and thought itself is often understood in terms of information processing and symbol manipulation (e.g. Pea, 1985; Jonassen & Reeves, 1996). In keeping with the phenomenological method, this dissertation will attempt to "short circuit" these and other theoretical assumptions or pre-understandings, and it will work to recover what they might hide or obscure.

What phenomenology seeks to recover or "re-awaken" is "meaning" or "meaningfulness" itself. Van Manen characterizes the emergence of meaning through phenomenological reduction as follows:

> ...the method of the reduction is meant to bring the aspects of meaning that belong to the phenomena of our lifeworld into nearness. In particular, it aims to bring into focus the uniqueness of the particular phenomenon to which we are oriented. ... it is perhaps experienced as a moment of lived meaning, of meaningfulness. (2001)

Through the reduction, the researcher becomes open to an experience of the phenomenon under investigation in terms of its uniqueness. This experience is one of the meanings of the phenomenon as it is lived. This "lived meaning" refers to meaning which is experienced in everyday, commonplace ways. It can be understood in terms of what has been labelled the "lifeworld." The lifeworld is "the 'world of immediate experience,' [the world that is] 'already there,' 'pregiven;' the world as experienced in the 'natural, primordial attitude'" (Husserl, as quoted in van Manen, 2001).

Van Manen goes on to explain that this lived meaning is not simply "given" or waiting to be found in phenomena themselves. Lived meaning is not free of the interpretive activity that leads us, for example, to perceive things in emotional, logical, or conceptual terms. However, in clear contradistinction to the explanations or analyses of science, the meaning or interpretation emerging through the reduction does not attempt in any way to be totalizing or to lead to interpretive closure or finality. Instead, as van Manen emphasizes, this experience and knowledge has to be constantly sought for and renewed by the researcher (2001). He also characterizes this meaning as arising from a "reflective attentiveness," a "state of phenomenological seeing... that is as much an experience of meaningfulness as it is a form of knowledge" (2001). Merleau-Ponty, for his part, characterizes this phenomenological method as "a matter of describing, not of explaining or analyzing" (1962, p. viii).

Significantly, in the terms of the information encoding, processing, and transmission occurring in digital technologies, meaning and semantics play a very different role. Computers, as John Haugeland explains, are directly comparable to "formal systems: game[s] in which formal tokens are manipulated according to rules" (1987, p. 48). "Since formal systems are (by definition) self-contained," Haugeland explains, "they never permit any (formal) role for meanings; as a result, traditional mysteries of meaning cannot infect them" (1987, p. 87). Computers, in other words, are concerned entirely with form or syntax, and are incapable of processing or dealing directly with meaning or semantics. They are, as Hubert Dreyfus explains, "syntactic engines sensitive only to the form or shape of their input" (2001, p. 16; see also Varela, Thompson & Rosch, 1992, p. 41).

However, meaning can be arbitrarily assigned to the formal symbols manipulated by the computer through a technique known as "mapping." This is a process through which "the relevant properties of [a] domain can be represented by symbol structures" that are manipulated by the computer (Winograd & Flores, 1986, p. 85). When computers manipulate or process these symbols, they sometimes give the appearance of possessing a sort of understanding of the meanings in question--as is sometimes demonstrated by grammar checking or email filtering systems. But as the frequent and sometimes frustrating errors made by such systems also demonstrate, this appearance remains an illusion. It is the product of clever mechanical tricks or ruses played by the program, rather than of genuine understanding of meaning or significance.

In order to map or encode a knowledge domain in a digital system, the knowledge or meaning in that domain must be represented in absolutely explicit, unambiguous terms. As Dreyfus (1992) explains, digital technologies "must take up every bit of information explicitly or not at all" (p. 241). He emphasizes that digital encoding can not accommodate tacit information. Background or contextual data also cannot be encoded as such (pp. 239-249). A computer, Dreyfus explains, "can deal with universally-defined, i.e. context free, objects. [A] programmer can only assign to. . . already determinate facts . . . further determinate facts" (p. 261).

The Anecdote

Conversely, issues of indeterminacy, ambiguity and context lie at the centre of the phenomenological method. The tentative, partial nature of the lived meaning that is uncovered through the reduction provides a powerful example of this. As a method, the reduction receives its validation precisely through the rich but indeterminate meanings and interpretations that it uncovers. This can be illustrated in relation to one of the specific research techniques that will be used extensively in this dissertation: the written "lived experience description" or the "anecdote." Van Manen describes the anecdote "as a methodological device. . . to make comprehensible some notion that easily eludes us" (1997, p. 116). Anecdotes are the basic means through which my research will attempt, as Merleau-Ponty says, to "reawaken the basic experience of the world of which science is a second-order experience" (1962, p. viii).

Van Manen further characterizes the anecdote as "a concrete counterweight to abstract theoretical thought" (1997, p. 119). The brief incidents described at the outset of this dissertation are examples of anecdotes: they do not present general principles, statistical patterns, or theoretical constructs that intend to speak to cases generally. Instead, they are very specific incidents that are intended to stand out precisely through their incidental nature, their individuality, particularity and ambiguity. Such anecdotes will be provided throughout the central chapters of the dissertation--often structuring the discussion and reflections presented there.

In further contradistinction to science and the scientific method, these anecdotes will not be understood in terms of their "factual-empirical" or "factual-historical" value (van Manen, 1997, p. 116). They will not be provided in this dissertation as empirical or historical evidence or even as real events. Although based on actual experience, their value is not to be measured in terms of their empirical validity or factual veracity. Instead, they have been carefully crafted in order to be, above all, recognizable to their readers. As van Manen explains, the ultimate aim of anecdotes is to "bring experience vividly into presence, making it immediately or unreflectively recognizable" (2001). To meet this criterion of recognizability, the anecdotes used in the dissertation have been subject to processes of painstaking composition, writing and re-writing. They have been circulated to a variety of readers, both expert and non-expert in the fields in question, and these readers' responses and recommendations have been incorporated into these anecdotes. Such tasks perhaps resemble much more the craft of the fiction writer than the fieldwork or data collection associated with many other qualitative research methods. And as such,

they again form a sharp contrast to the emphasis on the explicit, the unambiguous and the factual associated with data mapping and processing techniques.

In keeping with its emphasis on interpreted meaning or significance, this dissertation will also undertake an interpretation and metaphorical analysis of the literature of educational and digital technologies. As has been done above in the analysis of the "relationship" between computer and student, the dissertation will examine the metaphors, figures of speech, and vocabulary used in this literature, and enquire as to how these underpin the arguments and positions that are articulated in it.

Outline of this Study

This study's investigation of the question of the "pedagogical significance of the computer-student relationship" will be guided and structured by a four-fold understanding of lifeworld experience. As van Manen explains,

> Four fundamental lifeworld themes (or existentials) may be helpful heuristic guides for reflecting on human experiences: lived space (spatiality), lived body (corporeality), lived time (temporality), and lived human relation (relationality or communality). [These themes serve as] productive categories for the process of phenomenological questioning, reflecting and writing. (2001).

These four existentials are used to organize this dissertation's examination of the world opened up by computers and the Internet. Specifically, the themes are employed very explicitly to structure chapters four and five of this dissertation. These chapters will undertake an investigation of the computational and network world in which we are engaged with things, and in which we encounter other people. Both of these chapters examine their subject first in terms of the themes or existentials of the body, of space, and time (respectively). Then, each chapter presents a sustained discussion of the relational aspects of this world, in an attempt to address more directly this dissertation's central question about the relationship between student and computer.

The investigation undertaken in these two central chapters also deliberately cuts across a variety of technologies and types of teaching. The first of these chapters deals specifically with hypertext, multimedia and simulations--all taken as examples of types of objects we engage with when we are in front of our computers. The second of these chapters deals with the world opened up by what are frequently referred to as "online discussion forums," as an example of how we encounter others online. Both chapters bring these forms into direct comparison with more traditional, face-to-face or classroom-based forms and experiences. The first compares incidents from an online and a classroom-based biology course, and the second uses the concrete example of an undergraduate English literature course taught online and in a more conventional classroom setting. Both chapters structure the anecdotal material in the same way, first presenting an example from an online course, then describing an incident from a face-to-face setting. These anecdotes

and incidents are derived from interviews, observations, and personal experiences as both a student and a teacher in online and physical classroom settings, including an online version of a course on "Phenomenological Research and Writing" led by Dr. Max van Manen.

The narrative characteristics of the incidents and anecdotes presented in this dissertation are also intentionally consistent and comparable. This uniformity is very deliberately maintained in chapters three, four and five. For the sake of their recognizability and immediacy, all of the anecdotes in these chapters are written in the first person, describing the author, Norm Friesen, as the person at their narrative centre. As such, they frequently reflect my own experiences as a student and an instructor in a variety of situations and settings. However, as mentioned above, these anecdotes also incorporate the experience of others as well, gleaned through interviews and readings. Chapter three describes the experience of introducing WebCT (software for developing and teaching courses online) to university instructors, and reflects my years of experience as a trainer in educational technologies. The stories of engagement with digital and physical readings and dissections presented in chapter four are based both on my own experience with hypermedia and print media, as well as on interviews with instructors and students who have worked with these media and with animal dissections. The anecdotes provided in chapter five describe introductions and discussions undertaken in a literature course and are again based on interviews with instructors and students, as well as my own experiences both as a student and a language instructor at the university level.

Worlds and Words: The Language of Digital Technologies

Equivocal Vocabulary

Teaching Virtually with WebCT: May 5: Lab 12-0E, 9:00-3:30

Build a virtual course online quickly and easily with WebCT. Join Norm Friesen as he takes you through the stages of setting up a WebCT instructor account, uploading your course materials, hosting an online discussion, and more!

Responding to this announcement, over 15 instructors and faculty have registered to attend a full-day session of training. It is held during the intersession in an otherwise empty student computer lab. As the instructor, I begin the session by greeting everyone as they enter the lab, thanking them for coming to the class.

When I see that it's already 9:05, I begin: "I'd like to welcome everyone to this introduction to WebCT. I'm glad you could all make it!"

As people in the lab settle down, I continue: "As you may already know, WebCT is a product that you can use to accomplish on the Internet just about anything you can do in the classroom: class discussions, taking attendance, giving out and marking tests and assignments, distributing course handouts, showing video clips, even virtual labs: you can do all of these things and

more with WebCT, and with its various tools or components. In fact, the "CT" in WebCT stands for 'Course Tools.'

We'll start today's session by trying out WebCT's discussion tool and some of its other communication tools. Then, we'll look at putting course content online with WebCT's file manager and content module tools. Finally, we'll try testing and managing your courses with WebCT's quiz and student management tools.

This scene has become familiar in one form or another in many schools and institutions of higher learning. It involves the use of products or systems called "courseware" (Boston University, 2002), "learning management systems" (Hall, 2002), "virtual learning environments" (Britian & Liber, 2002), or "online course delivery platforms" (Moore, Winograd & Lang, 2001). WebCT is just one example of many products that go by these names. Thousands of educational institutions support and encourage the use of such systems by both instructors and students (e.g. WebCT, 2002). These products can be used to augment courses taught in the classroom or to teach courses completely online.

Significantly, the development and use of these systems has given rise to a wide variety of new word usages, combinations and phrases. Terms such as "virtual classes" and "instructor accounts," as well as the "course tools" and "components" that make up these systems are just a few examples. The ways that many of these words are used in these virtual contexts would seem unlikely in "non-virtual"

contexts of the physical classroom: Talk, for example, of a tool specifically for discussion, another for chat, and various components for handing out and receiving assignments would seem strange while working face-to-face. These tools, components and systems, moreover, accomplish many of their respective purposes in ways that are quite different from the classroom entities and activities to which they are implicitly compared. For example, in the classroom, "chatting" and "discussion" are, of course, oral and auditory phenomena; their counterparts in Web-based systems tend to rely exclusively on written language or text. It would also be difficult in a face-to-face context to clearly and consistently differentiate between a "chat" and a "discussion." But online, these two forms of dialogue correspond to two clearly separate tools. Also, access to a "virtual" WebCT class or course is gained through an instructor or other account--by supplying a specific user name and password--whereas a physical course is accessed through the doors of a classroom, and via the building in which it is located.

By implicitly bringing these very different physical and virtual phenomena together, terms such as "chat tool" and "online discussion" work in a broadly figurative capacity. They describe one thing in terms of another. In doing so, they highlight the characteristics that the two things may share. A password-protected Website is seen as being similar to a classroom, and forums for exchanging messages are compared to a face-to-face discussion. In some senses, these kinds of terms and phrases can be regarded as metaphors--where one word is used very directly in place of another to imply similarity between the two. For example, in using the

phrase "online discussion" takes the place of "message exchange" (or something like it) in the same way as "a red, red rose" would take the place of "my love" in a poem.

However, when an exchange of text messages is referred to as a "discussion," the implication is perhaps not so much that the exchange is merely a *figurative* discussion. The words "discussion" or "chat" are not used with quotation marks around them, and there is little to indicate that they are being used in any kind of unconventional way. Instead, the implication seems to be that words like "discussion" or "chat" identify both their online and offline counterparts with roughly equal accuracy--or that the qualification provided by terms like "tool," "online" or "virtual" is sufficient to make the implied equivalency acceptable. Terms like "discussion," "chat," "classroom" and others like it, in other words, become polysemous, or equi-vocal: they are made to embrace multiple meanings simultaneously.

Many other word combinations and concepts taken from the literature of educational technology can be added to illustrations such as those provided above. The computer as "tool," as "tutor," "tutee," or as mediating, for example, a "guided didactic conversation" all represent further instances of polysemous words--referring to experiences or phenomena familiar from the classroom in order to describe computer systems or applications, or experience of engagement with them. But the metaphorical, unconventional, or poetic character of this comparison, again, is not foregrounded in these terms. Instead, they are seen as embracing both their more

conventional meanings, as well as ones newly ascribed to them--all without being used in a figurative or radically new way.

More Metaphors

> As early in the day as possible, I try to get the participants to begin using WebCT for themselves: "Please open up a Web browser window. For those of you who do not have a browser currently open, please find the blue icon on the top left of your desktop, and double-click on it. From the bookmark list or menu, please choose the item labelled 'WebCT 101.'"
>
> I notice that one of the instructors is squinting at his computer screen, and seems uncertain of what to do. I ask him if his computer is working properly. He replies: "I'm not sure. I think there might be something wrong with the monitor." I walk over to his computer, and see that the desktop does not fit on his computer screen: it extends far beyond it, leaving the icon for his Web browser somewhere off the left side of the visible area. I immediately suspect that there is a problem with the screen resolution, so I right click on the desktop, and a tabbed dialogue box appears, allowing me to change this setting. A few moments after I do so, the entirety of the desktop becomes visible on the screen, with all of the contents scaled down in size to fit in the visible area.

In describing how to begin, and in assisting an instructor with a technical problem, more polysemous vocabulary comes into play: desktop, bookmark, menu, and tabs are all put to significant use. All these carry meanings that refer simultaneously to

realities in the world of the computer and the world of physical objects. This time, however, this vocabulary does not involve educationally-oriented terms taken from the classroom. Instead, it describes computer phenomena in general using terms taken from worlds of print artifacts, the office, and other domains.

In the research literature discussing the use and design of these windows, icons and other elements of the computer interface, they are referred to explicitly as "interface metaphors." As one source explains, such metaphors refer to "something that exists in the users' real world that could make it easier for the user to understand the use of the system" (Ericsson & Linköping University, 2002). A trash can, for example, is intended to signal to the user that, like its physical counterpart, it can serve as a means of disposing of unwanted documents.

However, if such elements are metaphors, then they are perhaps closest to what in rhetoric are called "dead metaphors:" words "which, like 'the leg of a table' or 'the heart of the matter,' [have] become so common a usage that we have ceased to be aware of [a] discrepancy" between the two entities being compared (Abrams, 1981, p. 64). As in the case of "discussion tools" or "content modules," we do not perceive word like "files," "documents" and "icons" as being figurative, unconventional or poetic in their juxtaposition of online and physical phenomena.

The sheer quantity and proliferation of such figures and tropes is remarkable. The words emerging from worlds opened up by the computer and the Internet is already something that already fills specialized dictionaries. And this language changes and

proliferates with such rapidity that any such listings or lexica are quickly rendered obsolete.

When is a Discussion a Discussion?

After a brief overview of WebCT and its features, I get everyone in the lab to log on to the same sample WebCT course. This allows them to try out the communication tools as members of a single class using WebCT.

"From the homepage, click on the 'communication' icon to try out WebCT's 'discussion' tool." When it looks like everyone in the lab has reached the right spot, I continue: "I'm going to begin the conversation first by selecting 'New Topic,' and then typing in a message in the text box." I enter a short, obligatory greeting, and click "send." I ask everyone in the class to click on "update listing," to check for new messages. I then ask them to respond to at least one message by selecting the "reply" button and writing in their own greeting. What follows is a flurry of typing and some quiet chatter and even laughter in the computer lab, as instructors and faculty send one or more messages to everyone in the room. Soon afterwards, I select "update listing" on my own computer and a long list of messages is produced--mostly replies to my initial message, but even some replies to these replies. I now draw the classes' attention to the front as I continue my presentation of the discussion tool; and I use the list of new messages to illustrate how quickly messages can pile up.

Referring to "communication," "discussion" and "chat" and even providing definitions and descriptions of these terms is not nearly as effective as allowing

people to experience these things online for themselves. If one expects teachers to feel comfortable using these technologies in their courses, it is best to let them first try out WebCT's (or any other system's) tools or components. When they have such an opportunity, teachers can instantly recognize, for example, how quickly unread messages can accumulate in an online forum. They can also easily gain an understanding of how one or more messages can be a reply to a previously existing message, or a reply to yet another reply.

One might conclude from this that the terms used to talk about communicating online are limited in their capacity to express what this experience is actually like. On their own, words like "discussion" or "chat" do not seem to clearly convey the particularities and characteristics that are a part of online discussion. Indeed, one can argue that they draw attention *away* from the many differences that separate an online experience from the physical activity with which it is implicitly compared.

Such a conclusion is given greater weight in the literature that provides tips for leading or "moderating" successful educational discussions online. A significant number of these tips identify characteristics and techniques that would clearly not apply to discussions held in more conventional classroom settings, and thus would not be meaningfully connoted by words such as "discussion" or "chat." For example, Morten Paulsen recommends that discussion facilitators attempt to "synchronize and resynchronize" the online conference: "Make sure that everyone begins concurrently and not in disarray and offer periodic occasions to restart in unison, summariz[ing] the state of the conference every week or two as a means of focusing discussion"

(1995, p. 86). In a classroom discussion--where everyone is in the same place at the same time-- such synchronization is obviously not necessary or at least does not carry the same signficance. As another recommendation, Paulsen suggests that the moderator consider "simulat[ing the role of] an agent provocateur. By using a pen name, instructors can question or challenge their own entries. This device could be used to set up a discussion or to set an example for student inquiries" (1995, p. 87). Again, in a face-to-face setting, where individuals are clearly visible to one another, such advice is also not pertinent. It is only in a text-based, online setting, where self-presentation occurs through description, that such a suggestion is at all reasonable.

These and other recommendations indicate that the word "discussion" is used equivocally to designate two very different things: a face-to-face conversation and the exchange of written messages using a networked system. On and offline, this innocuous word opens up and stakes out possibilities and limitations that differ substantially in meaning and practice.

Bulletin Board

> Next, I provide some advice on how to deal with the accumulation of messages in the discussion tool: "There are many features for organizing and coping with the messages that accumulate in a discussion. For example, WebCT lets you divide the discussions into a number of "topics." Each of these is a separate listing or page of "threads" and replies. This allows you to divide discussions up by subject, or by unit or week in your course. WebCT also lets you download the messages in a compact form so that you can easily print them off or read them offline. And WebCT also lists only new or

> unread messages by default, sparing you the need to see all the messages each time you enter the discussion forum."

Judging simply by the number of features designed to deal with the large quantity of messages that can accumulate in an online forum, this is one of the most obvious differences that separate online discussions from their counterparts in the classroom. Indeed, simply coping with the accumulation of messages is acknowledged in the literature as one of the primary challenges of teaching with this technology. Citing a variety of sources, Hara and Kling describe the "'daunting prospect' of being behind in reading messages" as one of the clearest "complications of asynchronous computer-mediated communication" (2000). As a result, they observe, "some students [do not have the time to] read other people's postings before writing their own. . . messages," resulting in fragmented communication (2000). In the physical classroom, on the other hand, the quantity of contributions that can be made is limited by the duration of the class and the course themselves. Students are forced by these and other constraints to take turns and to restrict the length of their comments.

All of this points to the fact that the concrete experience of sending and receiving text messages via a password-protected Website might be more effectively captured by using terms other than "discussion." These other terms should bring this particular experience into polysemous association with phenomena in the physical world with which it might have more in common.

Significantly, use of the term "discussion" seems to be a relatively recent means of designating these networked forums. It is a term whose use is clearly antedated by the use of the word "bulletin board." In its definition of "bulletin board systems," the *Microsoft Press Computer Dictionary* indicates that these systems were based on a type of modem-to-modem networking that predates the popular use of the Internet:

> BBS *n.* 1. Acronym for bulletin board system. A computer system equipped with one or more modems or other means of network access that serves as an information and message-passing center for remote users. . . . Users dial into a BBS with their modems and post messages to other BBS users in special areas devoted to a particular topic, in a manner reminiscent of the posting of notes on a cork bulletin board." (Microsoft Press, 1997)

So at some intervening point, it appears that the term "discussion" started to be used preferentially over the term "bulletin board." And with this new term comes a variety of possibilities and limitations--ones that are quite different from those suggested by the word "bulletin board."

Some of these numerous and considerable differences are explored in an early article by Don Beckwith. In it, Beckwith describes how he used a physical bulletin board in the 1980's in an effort to cheaply simulate the experience of posting and receiving messages in a networked computer "conference."

> At that time the primary application of computer conferencing was that of an asynchronous bulletin board through which participants could send and receive messages. The idea of using a real bulletin board was suggested. From a cluttered storage area came an old, portable 4x6 bulletin board on wheels. This was positioned in a hallway corner, giving access to the students before, after and during class. A stack of 3x5 index cards and thumbtacks were provided. (1987, pp. 91, 92)

So instead of a computer "conferencing" system serving as a figurative bulletin board, an actual board, with cork and thumbtacks serves as a figurative version of its online counterpart. By focusing on the physical thing that facilitates the exchange and by indirectly referring to the specific means through which it does so--messages, ordering, posting over a period of days or weeks--Beckwith is able to bring these old and new communications technologies into explicit comparison. And this helps him to establish clear and useful guidelines for the new technology.

> when putting a bulletin board on a conferencing system, we know from experience with the older technology to make the information readable, classified by topic, updatable, and scanable [sic]; and to provide mechanisms for keeping track of read messages, responding to messages, and so on. (1987, p. 90)

And not surprisingly, his description identifies a number of challenges that have been also identified in the literature of online conferencing:

> While the messages were interesting, with most of the ideas contained within coming from the students' outside readings, they didn't seem to be leading toward task completion. Rather, by the end of three weeks we had a bulletin board filled with disparate bits of information, all related in some way to the educational potential of the newer media, but with no creative focus. (1987, p. 92)

The term "bulletin board" thus may provide a means for orienting students to the technology that is much more specific and less ambiguous than the connotations provided by the term "discussion." The language that co-emerges with the technology shapes our experience of it. At the same time, the characteristics of the technology itself can make the meanings or connotations carried by certain words relevant or irrelevant, despite the significance that the words seek to convey or perhaps even impose.

Content, Content Everywhere

> After the lunch break, I begin with an overview: "WebCT's most important course tools fall into two main groups: first, there are the communication tools, including discussion and chat, which we looked at this morning.
>
> "The second set of tools is WebCT's 'content tools.' We will be looking at these this afternoon. These tools allow you to do things like uploading and managing your course content, and sharing it very efficiently with your students."

> I explain this in more detail: "WebCT and the Web in general can accommodate a wide variety of types of educational content: video and audio clips, animations, simulations, interactive exercises, and more. This multimedia content can be used to engage and motivate students; it can accommodate various learning styles, such as visual and auditory learning; and it can also be used to present difficult concepts and ideas clearly and effectively."

Much has been made of the variety of media available on the Web, and the convenience with which it can all be brought to our finger-tips. In her Web Teaching Guide, Sarah Horton explains that

> One of the most important advantages of Web-based instruction is the ability to employ multiple media types to present ideas and concepts. With Web multimedia, you can combine text, images, sound, and moving images on a single page. . . . Simply making these materials available on a Web site is of great value to your students. . . . Presenting students with multiple media options addresses learning at several levels and allows them to choose their own approach to comprehending the materials. (2000, p. 73)

The multiple media facilitated through the Web is seen as being even more powerful when connected together as "hypermedia." The term "hypermedia" refers to "the extension of hypertext to include other media" like "sound, graphics, and video"

(FOLDOC, 2002). Jonassen underscores the potential of hypermedia as a means for both disseminating and creating educational content: "ultimately, we could think about eliminating textbooks in the classroom and enabling learners to research ideas and develop their own interpretations in hypermedia" (2000, p. 211).

Radically new forms such as hypermedia become a possibility in part because computers and networks reduce all media formats and types of information to binary, digital codes of ones and zeros. Computers and networks are, simply put, mechanisms for encoding, transmitting and decoding these binary codes or bits. Nicholas Negroponte's Being Digital celebrates the uniform, interchangeable, instantaneous nature of these bits--and contrasts them to the much more cumbersome constituent parts of material goods, "atoms." Unlike atoms, Negroponte says, "bits commingle effortlessly. They start to get mixed up and can be used and reused together or separately" (1996, p. 18). They are not necessarily tied to any one physical format, and can take on many different forms, making it much easier to transport them, to present simultaneously, and to link them together.

However, when bits--audio and video clips, PowerPoint slides, texts, simulations, etc.--are used, reused, and mixed up in this way, factors other than their "weightlessness" and movement "at the speed of light" (Negroponte, 1996, p. 14) come to the fore. Different ways of using words and concepts suddenly become possible and acquire new cogency. In reducing everything to a homogeneous world of bits, these technologies give existence, force, and autonomy to abstractions and generalities that would otherwise be difficult to see as meaningful. They allow for

words to be used in polysemous or equivocal ways that span a wide variety of things previously understood as separate. Because of their abstract nature, computers can elevate words to a very high level of generality, and form categories that cover large numbers and new combinations of phenomena.

The word "content" exemplifies this kind of semantic shift and expansion. As this term is used in discussions of the Web and new media, content can be understood as practically anything that can be and is encoded as bits. It designates anything that a person could see, hear or act upon in being engaged with a computer. This semantic breadth is reflected in assertions that content is (or is not) "king" (e.g. Odlyzko, 2001), and in talk of content being provided, managed, rated, analyzed, guarded, or syndicated. As the breadth and range of these words indicate, content extends to practically any specific instance of a networked system's use: text messages, chat transcripts, and even logs of transactions can also be considered as content.

However, this is actually not the first time that the word "content" has been used in such an expanded sense. A conspicuous example is provided by educational and curriculum theories. Writing as early as 1966--well before the emergence of digital multimedia--Saylor and Alexander define "content" in terms that are remarkably similar in their all-inclusiveness to those used in discussions of digital media. Content, he says, consists of

> those facts, observations, data, perceptions, discernments, sensibilities, designs, and solutions drawn from what the minds of men have

> comprehended from experience and those constructs of the mind that reorganize and rearrange these products of experience into lore, ideas, concepts, generalizations, principles, plans, and solutions. (Saylor & Alexander, 1966, p. 160, as quoted in Miller & Seller, 1985)

Content as understood in curriculum studies works as an abstract generality that encompasses just about everything that it does in the context of computer media. The difference is that with computer media, this abstraction is actually instantiated: it is realized in a form that can be experienced directly through engagement with computers and Internet technologies. Content is no longer just an empty category; it is made real in the bits and bytes moving at the speed of light in a computer network.

Not all Content is Created Equal

> But before I allow those in the lab to work with WebCT's content tools, I warn them:
>
> "In putting content online, it is important not just to take texts, notes and just any other material, and upload it, regardless of what it is. This generally does not help students. When you do this, you end up with what is called 'shovelware'--the result of just 'shovelling' course contents online."
>
> "Instead, you should ensure your materials are specifically suited for the Web. There are many ways to do this, and they often involve shortening text,

> using points form, using small file sizes for images, audio, video, and providing your students with as much concision and clarity as possible."

Alistair Fraser explains that the term "shovelware" emerged during the 1990's with the introduction of CD-ROMs. As he defines it,

> shovelware can refer to any content shovelled from one communication medium to another with little regard for the appearance, ease of use, or capabilities of the second medium. (Fraser, 1999, p. B8; see also FOLDOC, 2002)

The medium, form, context, and situation in which "content" is presented, in other words, is important. Digital content is not simply bits of digital data, qualitatively undifferentiated, weightless, capable of being mixed, remixed and reused, simply on the basis of their homogeneous and atomic nature. When content is actually experienced or is the subject of engagement--when issues such as ease of use, appearance or educational value are of concern--this free-floating content suddenly becomes inextricably bound to the time, space and context of its instantiation or embodied use. Content, in other words, is closely associated with a form and a context in which it is useful or appropriate, and with a way and setting in which it is known and made knowable: It is encountered as a image on a Webpage, a sentence in an e-mail, a passage in a page or book, or a sequence in a multimedia presentation, for example.

When the abstract notion of content is concretized in specific instances and situations, the unity to which the abstraction appeals to suddenly appears fragile. As soon as we talk about content in any specific instances, it immediately becomes something *other* than simple bits of "content"--free-flowing, weightless and interchangeable. Questions of appropriateness, engagement, usability, preferences, styles and much more come up. Something similar also happens in relation to the abstract term "communication:" Along with "content," it is one of the prime categories in which the tools and functions of WebCT are presented--and in which the educational and other potentialities of the Web as a whole tend to be understood. However, like content, as soon as "communication" is seen in terms of specific tools, contexts, and types of engagement, it becomes divided into the categories or tools of "discussion" and "chat"--and further into "topics," "threads," and "replies." All of these are words or categories register significant qualitative differences in terms of subject or theme, order, and temporality.

The problem is that after making such differentiations we then return to the use of categories like "content" and "communication" in educational discussions as if such differences can easily be ignored. Computer and network technologies enable and instantiate expanded and new meanings in their abstract, computational realm. These words then return to the concrete world and are used as if they had the same force there.

In explicit recognition of the local, specific, and embodied dimensions of education that the abstraction and generality of computers tend to conceal, the next two

chapters are as particular in their focus as possible. They look at specific, concrete examples or anecdotes; first at two specific phenomena that are often covered by the term "interaction," and then at experiences that are often labeled with the word "communication." In both cases, I hope to break the spell of homogeneity and identity that is cast by the abstraction and generality of computational and theoretical constructs. I will consciously avoid the uncritical usage of broad and conceptually-loaded terms such as "content," "communication" and "interactivity." I hope to show how the experience of that which is frequently gathered under the rubric of "interaction and "communication" is inevitably realized in and emphatically oriented to the concrete, the specific and the local.

Acting in Worlds: On and Offline

Body, Space and Time

Personal Paths to Learning

"Click!" A new Webpage opens in my browser. It's an overview for my introductory biology course, and it links to a large number of readings and assignments:

I click on "Week 1, Assignment 1: Investigation of Issues," and begin reading more carefully:

The science of biology has been the source of much public controversy recently. Areas of widespread concern are often related to genetic engineering, and include genetically modified foods, cloning and stem-cell research.

Please read any two articles accessible from the websites listed here and then answer the two questions, below. Your answers will be marked and your grades returned via email by the end of next week.

- Human genome project primer (http://www.ornl.gov/TechResources/Human_Genome/publicat/primer/intro.html)
- Articles in the GeneLetter (http://www.geneletter.com/)
- The Human Genome Project: Exploring our Molecular Selves (http://www.genome.gov/Pages/EducationKit/video/qt/3D.mov)

Questions:

1. Enter the Web address for the material:
2. Describe in your own words what the article is about:

* * *

"One of the things I want to make sure we do in this course is to understand some of the social impacts of the more recent developments in molecular biology," the instructor states as he paces across the front of the large and crowded lecture theatre.

"So we'll begin by looking at some articles on genetic engineering. This is what this week's assignment is all about. To complete it, you'll be reading the two articles I photocopied and handed out at the beginning of class." While the instructor continues, I leaf through the handouts that we were asked to pick up on the way to our seats. "I want you to read these articles, and answer these two questions I've written on the board. One: 'how is the article related to biology?' Two: 'how might the issues discussed affect you?' I'll be marking--or rather, my teaching assistant will be marking--your answers. She'll be looking for some sign that you've read the article, and whether you understand the introductory lecture I gave on Monday." As the instructor explains this, I jot down the two questions from the board at the top of one of the handouts.

"You have a question?" the instructor asks as he points to someone at the front of the theater. Because I am sitting at the back, I strain to listen: "How long would you like our answers to be?"

Planning the general shape of a course, and its individual assignments--and having them all contribute to the course's overall goals--is of undeniable importance in

teaching. It is often vital to the success of a course that there be a variety of activities, and that they build on one another appropriately. These activities or exercises also need to be clearly and unambiguously described.

Writing specifically about school education back in 1949--but in a passage that is still cited today in many contexts--Ralph Tyler articulates these points as a series of questions:

> [There are] four fundamental questions which must be answered in developing any curriculum and plan of instruction. These are:
>
> 1. What educational purposes should the school seek to attain?
>
> 2. What educational experiences can be provided that are likely to attain these purposes?
>
> 3. How can they be organized?
>
> 4. How can we determine whether these purposes are being attained? (Tyler, 1950, pp. 1-2)

The incidents described above indicate two fairly different ways of selecting and organizing educational experiences, and of relating them to the attainment of educational goals or purposes. One is in a conventional classroom setting; the other, a course offered online, accessed via a computer and the Internet. In each case, the way that these instructions are provided, and the means by which the student receives course materials is quite different. In the online course, all of this information is provided in hyper-textual form, and is accessed by selecting or

clicking on links. In the classroom setting, the readings are provided in printed, photocopied form. (Note that the correspondence of print materials with classroom settings is not one of necessity, but perhaps more of convention.) In this context, instructions are provided through the explanations of the teacher, and are written on the blackboard. However, in each instance, the student is being asked to do something quite similar: to read some course materials, and to answer questions about those materials.

Since the popular advent of the World Wide Web, a great deal has been written on how this new medium presents significant advantages for such interaction and learning. It tends to be described as providing more choice and greater interactivity:

> Web-based instruction can be conveniently modified and redistributed, readily accessed, and quickly linked to related sources of knowledge, thus establishing a backbone for "anytime, anywhere" learning. (Olsen &Wisher, 2002)

As a simple example, in the incident above, the student studying online is able to choose between many different articles to read. The number of articles that the instructor can hand out in the conventional classroom is strictly limited by costs and other factors entailed in physically reproducing and distributing them. In addition, there is apparently greater opportunity for interaction with these resources on the Web: the links connecting the pages and sites together provide the student with a variety of ways of navigating the plentiful articles on the Web. Finally, these articles

may contain multimedia resources (images, sounds, animations, video clips) that allow for further interaction and greater choice. Using the term "digital media" to refer to the myriad formats and media available on the Web, Papert characterizes these advantages as follows:

> What I see as the real contribution of digital media is a flexibility that could allow every individual to discover their own personal paths to learning. This will make it possible for the dream of every progressive educator to come true: In the learning environment of the future, every learner will be 'special.' (as cited in Tapscott, 1998, p. 146)

But do digital media and Web technologies actually allow this to occur? What kind of "flexibility" and "personal paths to learning" do these new media provide compared to more traditional forms?

The Body of the Text

> *The next day, I return to my online biology assignment. I make myself comfortable to in the computer chair as I click to reach the page of assignments and readings. I tap the mouse a couple of times sharply on the threadbare mouse pad to prevent the cursor from sticking. I reach a site called "Human Genome Project Primers." It is a short page that seems to provide links to longer articles. One of the items is labelled "Genomics and Its Impact on Medicine and Society: A Primer." It takes me to a page with a fairly long listing of links. Together, they look like the contents of an entire book! I click back and fourth between this list of links and the articles or*

chapters themselves, and scroll up and down and see that this text is altogether too long.

* * *

Sitting at the bus stop later in the afternoon sun, I take out the articles assigned in class, and try to make myself as comfortable as I can on the hard wooden bench. As I lift the first stapled article from the other handouts, I notice that its quite light and short. In fact, now that I look more closely, both articles appear to be shorter, non-technical pieces from magazines--from *Time*, *Newsweek* or *Discover*, by the look of it. But the dates or names at the edge of the pages have been cut off by the photocopier. I flip through the stapled pages, and notice that there are a number of images. But it's hard to make out what is in them; they are rather dark and blotchy, probably from repeated photocopying. I look at the questions that I've written at the top the first article, get out my yellow highlighter pen, and begin to read.

Working or "interacting" with course materials both online and in print form share some obvious similarities. Even if they both do not entail a great deal of active physical involvement, both are undeniably physical or embodied phenomena. In both cases, this engagement means that the student makes him- or herself reasonably comfortable, focusing the gaze and attention on the materials at hand.

Sitting at a bus station or in front of a computer, interacting with materials online or in print requires that one is positioned at a convenient reading distance. With a

computer, the reader must sit directly in front of the screen, often on a special "computer chair." One hand is usually positioned at or near the keyboard, and the other typically rests on the mouse, ready to click, scroll or otherwise "interact" with the computer. Print materials allow more physical, bodily flexibility, and can be read at a bus stop and a wide variety of other places. But in both cases, attention is paid to the body precisely so that the body can be forgotten, and so that the material at hand can become the focus of attention. Talking about language use generally, Drew Leder explains this as follows:

> The result is that language use is compatible with relegating most of the body to a merely supportive role. I forget my torso, the position of my legs, the panorama of the senses, as I concentrate here on reading and writing. . . . Other bodily regions recede into a tacit background. (1990, p. 122)

However, there is another physical entity, another figurative "body" that is involved in my engagement with my course materials. This is the body of the text, the page, that which is displayed on the screen, and the physical artifact of the computer I use to access and manipulate it. This "body" becomes manifest in my difficulties in getting the computer mouse to work consistently, and scrolling and clicking through the various Web pages. It also manifests itself in my estimation of the weight and thickness of the first article, and in the act of flipping through its pages.

The printed text and the onscreen text, in other words, both have their own physical characteristics that affect how they are experienced. Handling the physical reality of

a photocopied article is quite different from exploring a text online by clicking, downloading and scrolling. The physical form of the printed documents themselves provide weight and thickness, allowing me to judge, as soon as I see them or have them in my hand, how much reading material I will likely be dealing with. The format of the pages, moreover, belongs to the deeply ingrained conventions of print formatting, organization and genre--allowing me to guess, for example, that the articles are from magazines like *Time*, *Newsweek* or *Discover*. The physical contiguity of any one page to other pages, its place within the linear order of the text itself, and other physical and conventional attributes all contribute to my sense of the text as a whole, and to the meaning that I would associate with any one page or passage in particular. The blotchy photos and fact that there are only a couple of articles available are also part of this physical character. Such limitations are imposed by the fact that it needs to be physically reproduced, and that the process of its physical reproduction is not perfect.

The figurative body presented by the links of the Web pages and sites are quite different. They are accessed through mouse moves and clicks, a screen and keyboard, an Internet connection, and other supporting technologies. Many or all of these technologies must be operating at the time of reading. Also, the digital media thus accessed can take on a variety of forms: for example, HTML, Acrobat, and PowerPoint. However, none of these forms is manifest in a physically tangible way--unless the student decides to print them, in which case they enter the world of print, and cease to be "interactive" digital resources. Perhaps as a partial result of this, it can be difficult to determine the precise nature of the resource with which one is

engaged. It is not clear, for example, if the item I examine initially is actually an article, or whether it is more like a book. Although formats and conventions have developed regarding different materials and genres of Web resources, the physical form of the computer itself does not change. The only means available for discovering such basic contextual information as genre, scope and contents tend to be achieved by clicking and scrolling. The interactivity provided by clicking, selecting and scrolling might be said to be used to compensate for the lack of other physical attributes--such as weight, form, size, shape, etc. The respective physical character of the print and online resources also affects the ways that they can be personalized by the student: It is usually not possible to change the appearance of an online text, either through highlighting or jotting one's notes.

The literature of educational technology tends to deal with some of these matters by talking about "degrees" or a "continuum" of interactivity (Kristof & Satran, 1995, p. 37; Tannenbaum, 2001). Accordingly, various levels of interactivity have been identified, with print media or content being the lowest, and simulations and software affording manipulation being near the top:

> A "minimally" complex production might have only still images and no interaction; a "moderate" one might have motion graphics or animations together with some learner inputs and responses; and a "high" level production might include three-dimensional, interactive models. (Tannenbaum, 2001)

But does this reflect the experience of working with these materials? If we can tell something is an article from formatting, weight and thickness, isn't this a kind of interaction? (Especially if very explicit and "higher" interactivity--scrolling and clicking--are used to discover exactly the same things online?) Does interactivity reflect the kind and quality of *engagement* that is possible? Is there a different kind of interactivity that occurs with print? Is there a word or category that might be better than "interactivity?"

Text-Time

> *I click the back button twice to return to the assignment, hoping to find something shorter there; I select the link it provides to "GeneLetter." I see a list of article titles using complex, specialized terminology. "Screening for hereditary hemochromatosis," or "Connexin-26 connects to prelingual deafness." But then I notice a colourful image for the site's "Featured Link." It asks the simple question: "Have you actually seen DNA?" I click on it, scroll up and down and see that it is relatively short. At the bottom, a link to yet another article catches my attention: "Have the child of your dreams!" "What could that be about?" I wonder. But as I click and look at it, the mouse gets stuck again. I look up in agitation, and am suddenly am reminded of where I am: in a packed computer lab on campus. The room is filled with people, but it is silent except for the whirring of cooling fans and the clicking of keyboards. I look at my watch and realize that 15 minutes has passed. I need to get down to some real work!*

* * *

> On the bus ride home, I get out my course materials again. I shuffle through them, and start reading an article published in 2002 by someone named Stix. It tells the story of a scientist and entrepreneur who had just received his undergraduate degree from Harvard: "He gained top honors, eventually graduating *summa cum laude* in 1996. But he still found enough time to contemplate the germ of an idea for a technology that would build on the scientific findings of the Human Genome Project, then in its middle phases. 'Is it possible for us to gain complete sequence information from every single person on the planet?' he recalls wondering" (Stix, 2002). I flip ahead in the text, wondering if such a problem could ever be solved. But then the bus suddenly comes to a halt at a bus stop, and I look outside. It's my stop! I rush to the door and scramble outside. I stand at the stop, and catch my breath as the brakes of the bus hiss, and it lurches onward in its journey.

It is possible to get lost in reading a text or a book, or in browsing or surfing online. In both cases, one's sense of time as something that passes along minute-by-minute is greatly diminished. Time is not an experience of waiting or measured duration. We become much less aware of the passage of time, or indeed of much that is going on around us. Instead, we are engaged with what is on the page or the screen.

It is this engagement that exemplifies what it means to say that both the computer and the printed word open up "worlds" to those involved with them. This is a world of words, images, and (in the case of the computer) video and audio clips, and simulations. But it is--to a greater or lesser degree--a world that can absorb our imaginations, in which we can even sometimes smell, feel, and otherwise sense and

experience things which go far beyond mere words on a page or pixels on a screen. It can absorb our minds and engross our imaginations. This engagement and absorption can be so intense and complete that we can be, experientially, in another time and place. Another time and set of circumstances may be unfolding in the outside world, but we are, in a certain sense, not a part of it. The words we use to describe this state are telling. Absorption, immersion and focus, being engrossed, occupied or preoccupied: words such as these suggest that we are somehow assimilated or consumed, that our attention is monopolized by the matter at hand.

It is only when we are surprised, experiencing, for example, an unexpected bodily sensation, that we are drawn out of this engrossing world. The computer mouse getting stuck, the bus lurching to a halt, or simply our body reminding us that it is sore, tired or hungry, a phone call or other noise, will typically bring us out of this state. But do page and screen bring us into such a state in the same way? Is the state or condition of absorption or preoccupation really the same in both cases?

It seems that the state of immersion in text and hypertext, on the page and the screen, are actually quite different. Computers and the Web seem to compel us to action rather than leading us to the quiet repose that seems more typical of reading. For example, what absorbs my attention on the Web is not the perusal of any one article. Instead, I click and scroll back and forth between sections, pages and multiple articles. "Browsing" is a term commonly used to designate our engagement with the Web, suggesting as it does a leisurely motion that does not rest at any one place, but that involves a constant traversal of documents, sites and pages. It is also

powerfully characterized through the term "surfing," connoting an almost unstoppable forward movement of the user swept along by "waves" of information. Such compulsive movement--and the temporal experience it implies--is described as follows by Michael Heim:

> Hypertext helps us navigate the tide of information. In skipping through hypertexts, we undergo a felt acceleration of time. . . . the term *hyper* in hypertext starts to remind us of another of its cognate meanings. In psychology, medicine, and the social sciences, the prefix *hyper* means "agitated" or "pathological." Hypertext thinking may indeed reveal something about us that is agitated, panicky, or even pathological. As the mind jumps, the psyche gets jumpy and hyper. (1993, p. 40)

By contrast, when we are reading, we are generally not *doing* anything else--at least not anything that significantly occupies our conscious attention. It is the accomplishment of just one thing: engagement with the text. It may involve flipping impatiently through a book to see when a chapter or section comes to an end, but inevitably it entails the scanning of lines on a page, understanding or absorbing at least some of their meaning, and seeing how the contents of the various lines and pages build on and connect with one another.

Interestingly, Marie-Laure Ryan (2001) identifies four different kinds or levels of engagement associated specifically with print or with the "act of reading." The first is "concentration," which is "attention devoted to difficult, nonimmersive works"--

those which offer "so much resistance that the reader remains highly vulnerable to the distracting stimuli of external reality" (2001, p. 98). The second is a type of "imaginative involvement" in which the reader "transports herself into the textual world but remains able to contemplate it with. . . detachment" (2001, p. 98). The third is "entrancement;" a type of "nonreflexive reading" in which the reader is "so completely caught up in the textual world that she loses sight of anything external to it" (2001, p. 98). And the fourth, "addiction," is characterized by the will to "escape from reality," to cease making a distinction between "textual" and "actual" worlds (2001, pp. 98, 99).

Whether taking place via the printed word or words on the computer screen, this absorption and engagement seems to be a significant factor in "interaction." However, it appears to take qualitatively different forms in online and print media. How can we further understand this difference?

Text-Space

> *I get the mouse unstuck, and before I get down to work, yet another link catches my eye "Clones-R-Us: http://www.d-b.net/dti/." This site announces that the company of the same name has "Hundreds of satisfied clients." "Weird," I remark quietly to myself as I shift in my seat. I click on a link labeled "price list," and see $79,999 next to Cindy Crawford's name, and $1,499 next to "Dolly Parton." I groan as I realize that this site is all just a joke--and a rather bad one at that!*

I go back to the page outlining the course assignment. I now notice that one of the links actually points to a movie: "The Human Genome Project: Exploring our Molecular Selves." I think to myself: "This will be the easiest, and I've got to get this done!" I click to download.

* * *

When I get home, I lie down on the couch, and take my course readings out again. I prop my head up with a couple of cushions, and continue reading:

> With the help of five others who joined the newly formed company, Chan fabricated a series of upright posts, each spaced a few tens of nanometers apart, at the mouth of a channel down which the DNA was to travel. The posts snagged the ball of DNA, and the pressure of the molecule against the posts caused it to unravel and stream down the channel toward the optoelectronic detector. (Stix, 2002)

I try to imagine this process in my mind, a strand of DNA, flowing with smoothness and precision along a microscopic channel, unraveling as it travels. But I wonder: Is it a double-helix strand that the article is talking about? Or is it something else? I seem to recall the prof talking about single RNA strands as well, but I can't quite tell from the description.

The worlds that text and hypertext open up present an experiential space to those engaged with them. It is a space of the imagination presented by the words on the

page or the elements on a screen. Spatial metaphors are used readily in the way we talk about engagement with page and screen: We speak of texts, especially fictional ones, as taking us to far-away lands, and providing us with escape from our immediate surroundings. We speak of engagement with computers and the network as taking us into "cyberspaces" and into "virtual environments" such as a virtual classroom or a virtual campus.

It is also worth noting that the destination of this hypertext travel itself tends not to be hypertextual. When we find reason for pause, it is often for an extended text that is printed off in order to be read (e.g. Nielson, 2000), or a video or other media segment that we pause to watch. And these forms tend to be markedly linear and traditional in structure. In the above examples, I click through a number of pages, rarely reading more than a few lines. Each page, however interesting or promising as a potential reading assignment, always points to something that appears to be even *more* interesting: "Have you ever actually seen DNA?" leads me to "Have the child of your dreams!" which in turn leads to the even more interesting title, "Clones-R-Us." Instead of pausing to read any of these, I quickly try figure out what they are all about. It is only when I pause to view a short video that this motion and travel comes to an end.

As indicated above, the cyberspace opened up through hypertext and other digital resources seems above all to be a space of passage and movement. The terrain explored through clicks, links and successive pages, in other words, is one that compels movement through it. A page, image or other media element may form a

brief respite along the way; but it is this sense of space as a conduit for motion and travel that appears also to be emphasized in Web terms such as "links," "portals," or "gateways"--words expressing ingress, egress, passage; not arrival, respite or stasis.

Ryan compares the space that hypertext opens up to "non-places"--spaces "that we traverse on our way to somewhere else" (2001, p. 261). These include the spaces of an

> airport, subway, freeway, and the network of Information Superhighways that crisscross cyberspace, the most nonplace of them all. Cybernauts and hypertext readers spend most of their time clicking on the nonplaces of the links, never dwelling for long on a textual segment, because each of these segments is less a destination than a point of departure for other, equally elusive destinations. (2002, p. 261)

The space opened up by the text, however, is quite different: Lying on the couch, I read in a state of relatively quiet repose. Seeing the description of "unravelling" of the DNA strand by carefully arranged posts and channels, I imagine in my mind how such an event might appear. This imagining takes place without any visible or tangible manifestation. It seems to occur in a space that is entirely internal to my "self." It is, in a certain sense, mine alone, a private and subjective place.

In the considerable literature that has been written about the culture of the text and print, this space that the printed text opens up is often closely related to the inner

realm in which we understand our inner "selves" as existing--our private, subjective, interiors. From Emmanuel Kant in the 18th century to Marshall McLuhan in the 20th, print has been associated with the development of the "public sphere" and a corresponding "private sphere" that are described as essential to individualistic, democratic society. Focusing specifically on the convenience and uniformity of the mass-produced book, McLuhan marvels, for example, at how in the modern era, "the portability of the book. . . added much to the new cult of individualism," creating a "new urban or bourgeois man" (1962, pp. 206, 213; see also, Kant, 1784). Walter Ong--a student of McLuhan's--takes this further, stating that "highly interiorized. . . consciousness" evidenced in the novel and other modern cultural forms "would never [be reached] without writing. . . ." "Writing," Ong explains, "introduces division and alienation, but a higher unity as well. It intensifies the sense of self. . . . Writing is consciousness raising" (1988, pp. 178-179). It creates the place that is named by words like the "private sphere" or the subjective "interior."

Seeing is Believing

After a brief opening, the video clip zooms into many colourful, abstract depictions of DNA, and its reproduction and dissemination through RNA. It explains how DNA provides the formal basis for the construction of complex proteins.

Figure 4: DNA and RNA

It shows the DNA strings, how the patterns of genes are reproduced from tiny "building blocks." The music is distracting, however, and I find myself having to pause and reverse the clip to ensure I get at least a basic idea of what it's saying.

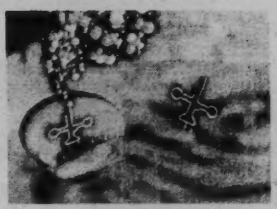

Figure 5: Construction of complex proteins

(See: http://www.genome.gov/Pages/EducationKit/download.html; http://www.genome.gov/Pages/EducationKit/video/qt/3D.mov)

* * *

I continue reading in the article to see whether Chan is able to succeed in his ambitious quest. "A video that shows the DNA moving along the channel served as a proof-of-principle that allowed the company to return to the venture spigot in 1998 to raise $2 million. That led immediately to the next hurdle-the placement of fluorescent tags on the DNA and the detection of the base-pair groupings as they passed the detector at a rate of 30 million base pairs a second" (Stix). I really wish I could see the "proof-of-principle" video that shows the DNA moving through the channel. Fluorescent tags, 30 million base pairs a second, and a detector capable of working at this size and rate--I wonder what that might look like!

Engagement with video appears to be of quite a different sort than with hypertext--and possibly much more closely related to the experience of reading text described earlier. Even though it is found on the Web, the video clip asks of its viewer something quite different than the restless movement associated with hypertext. The

video that I view presents a short, linear narrative, with very few interactive options--only with the familiar pause, rewind and fast-forward features. However, it also provides a great deal of information about DNA and its reproduction. The attention with which I watch might fall somewhere between the "imaginative involvement" and "entrancement" identified by Ryan. These are states in which the reader is transported into the world presented on the page or screen, but in which the reader also retains a greater or lesser awareness of the world external to her. Correspondingly, I listen and watch carefully, but am also aware of the clip's distracting music; I pause and rewind the presentation. I am not completely absorbed by it, and have not completely relinquished control to the world it opens up.

The experience of watching the video clip opens up a world that provides much greater, more exact and determinate detail than a textual description ever could. Indeed it, it is this kind of detail that I find myself wishing for in the context of reading an article on a similar subject. In the context of that same article, such detail seems to be indispensable, moreover, in helping to convince others of the value of Chan's venture. For it is only after he shows a video of the process of the "DNA moving along the channel" that he is able to convince investors to back his efforts.

It seems that engagement with text, on the other hand, is so closely associated with absorption and interiority because the meanings that are created through it are at least somewhat private and personal. One of the things that may make engagement with text as absorbing as it can be is the fact that we construct private meanings

when reading. Even when I read the article on Chan's project, I find myself imagining what it would be like: creating my own image, however inexact or incomplete. Videos--cinema, movies, TV--replace this "virtual" and internal vision of the imagination with a fully-realized image in all of its splendid detail. Compared to reading, these media leave little or nothing to the imagination, as is sometimes said. But in doing so, they can provide images in all their exactitude, in an open, public form. Whereas no one has access to the precise form and feel of my imagining, anyone can download and view the clip I have just viewed in all of its precision. And in the realm of science--and especially the complex forms of DNA--this exactitude and detail, and its public accessibility represents an enormous advantage: "Seeing is believing," as is often said.

So there is a clear pedagogical advantage that is presented by this instance of digital media; and this advantage seems to be lost in the motionless repose of print materials. But of course, there are other advantages and disadvantages associated with these two media.

Whose Order is Imposed?

As mentioned above, in the literature of Web-based educational technologies and of distance education, the question of how the student works with readings, exercises and other materials is frequently understood in terms of "interaction," and this interaction is seen as taking place with "content." A phrase that is commonly used in this connection is "student-content interaction." In a seminal article on this and other types of interaction, theorist Michael G. Moore explains that student-content

interaction "is a defining characteristic of education. Without it, there cannot be education, since it is the process of intellectually interacting with content that results in changes in the learner's understanding. . . a change in perspective, a change in the cognitive structures of the learner's mind" (1989, p. 2).

In discussions of the interaction between student and content, forms with higher levels of interactivity are understood as presenting an advantage. As Tannenbaum says in the article cited earlier, "Significant instructional value has been observed and attributed to such factors as engaging students as active participants in their learning through increased interactivity" (2001). The higher the level of interactivity, so the argument goes, the greater the potential for learning.

David Jonassen brings this to the fore in his discussion of hypertext. Hypertext for Jonassen is a particular instance of a cognitive technology, a "mindtool" that puts "the learner. . . in charge" (Jonassen, Peck & Wilson, 1999, p. 13). Jonassen explains the educational potential of hypertext by emphasizing that, as the prefix "hyper" suggests, hypertext is in some significant sense "beyond" normal text; it is "supertext:"

> Hypertext is supertext because the reader has much greater control of what is read and the sequence in which it is read. [The advantages of hypertext are] based on the assumption that the organization the reader imposes on a text is more personally meaningful than that imposed by the author. . . . Like most information systems, interaction is the most important attribute. (2000, p. 208)

Hypertext, as Jonassen explains, puts the learner in charge by allowing her to impose *her* own organization on the text, rather than that of the author. But Jonassen goes further:

> Learning consists of building new structures by assimilating environmental information and constructing new nodes that describe and interrelate them with existing nodes and with each other. It requires forming links between existing knowledge and new knowledge. . . . (1993, p. 155; see also Jonassen, 2000, pp. 205, 58-62)

So, as Jonassen would conclude, the pedagogical advantage of hypertext consists of its similarity to the way the mind and learning itself works: both involve the construction and linking of nodes of information, and the connection of these nodes to new and existing information. Such formulations are echoed by Moore and others when they speak of "cognitive structures in the learner's mind" (Moore, 1989, p. 2; see also Jonassen, 1993, p. 3).

However, as the examples above show, the everyday experience of the hypertext environment of the Web presents something quite different from the "personally meaningful order" or the effective assimilation and interrelation of nodes that Jonassen describes. This experience suggests that the choice and involvement that interaction provides does not mirror or facilitate the construction or revision of similar structures in the mind. It shows instead that this interactivity is used for

much more mundane tasks, often simply to discover what kind of site one has reached, or to gain access to more traditional or linear media such as a print document or a video or audio clip.

In contrast, the way print works--and the levels of engagement Ryan associates with it--also speaks to this issue of choice, freedom and authority, but in ways that are perhaps less obvious. Plain printed text provides us with the freedom and choice precisely by what it does *not* say and what it does *not* do. Through its imprecision and its indeterminate character, it opens up a space of the individual imagination. It opens up a space within which we have the freedom to engage privately and personally with the text. But this engagement does not happen in a manner that is simply capricious or arbitrary. Instead, this freedom that text offers us is realized by absorption in--or perhaps what may be called *submission to*--the order it presents: its meanings, its limitations, and the constraints and possibilities determined by its physical form and its genre. In return, reading and the text provide us with the basis for a meaningful and enriching--but not entirely arbitrary--exercise of freedom.

Relation

Dissection Day

A few weeks later in the course, we are required to complete a dissection exercise. From the "Course Outline," I access a site called froguts.com. In preparation, I have read a short document written by the instructor that explains the dissection, what we are to do, and why we are required to do it.

Figure 6: Frog dissection

After waiting a while for the dissection to download, an image of what appears to be a large frog fills much of my browser window. Before I can respond, text appears instructing me to "Insert the pins." This I do by moving my mouse over them and clicking. As I insert the first one, the text tells me: "That's right," and then that "The pins ensure that the frog won't shift." When I'm finished, a "next" button appears at the bottom of the window.

* * *

The stinging tang of formaldehyde is first thing that greets me as I walk into the biology classroom. I feel a mixture of apprehension and anticipation as I see the dissection trays and instruments neatly arranged on the lab tables. Earlier that week, I had read an assigned handout that described what we were going to do in the dissection, but had forgotten that it was actually to begin *today*! As I approach one of the trays, the smell becomes stronger,

> and I peer into it with some trepidation for a closer look. In it lies the inert body of a tiny pig in a pool of clear liquid, its listless body a bright pink. Its eyes are shut, and what looks to be a swollen tongue sticks out of its mouth. As I imagine slicing into this helpless pink body, I feel a distinct sense of unease. Today is the day that we begin our dissection. As more students enter and the room becomes abuzz with excitement, the teacher exclaims: "Please do not touch anything! We will begin to work together, step by step, through the dissection once everyone has arrived."

Dissection is a complex and involving activity that can require careful preparation both on the part of those providing the instruction and of the students undertaking the dissection. Whether it occurs on or offline, preparatory reading by the student is typically required. In both cases, instructions need to be followed cautiously, in an organized, step-by-step manner. And both online and in the classroom, careful guidance, confirmation and correction are of great importance.

But obviously, the experience of actually undertaking a dissection in a classroom or lab is quite different from working with an online exercise. Instead of formaldehyde and lab equipment, this "virtual" scenario calls for a computer, a mouse, and an Internet connection. Getting a glimpse of the frog is a matter of waiting until it appears in the browser window, and pinning it down is accomplished through pointing and clicking. Face-to-face, the dissection initially presents itself through the acrid tang of formaldehyde, which stings my nostrils as I enter the room. When I see

the pig about to be dissected, what strikes me about it is its inertness, and an impression of its helplessness.

The online or "virtual" dissection activity corresponds to what is generally known as a "simulation." Popular in the military for decades (Jacobs & Dempsey, 1993, pp. 199-200) simulations and related interactive resources are now available on the Web in the form of small, inexpensive or freely distributed programs that can be downloaded or viewed by simply using a Web browser. Some of the advantages these simulations are said to present include reduced complexity and teaching costs, and the ability to support education at a distance. They permit students to work in situations where there may be no physical lab to allow for real experimentation and exploration. In the specific case of dissections, they also serve as an alternative to an activity that some students find ethically objectionable or otherwise repugnant (Fleck, 1999). A simulation can be defined as "a resemblance of a phenomenon that imitates [the] conditions and actions" of that phenomenon (Jonassen, 2001, p. 138). And in the case of the learning activity described above, the simulation attempts to imitate the conditions and possibilities that, of course, would be encountered in dissecting a frog.

Simulations are quite different from the hypertext and hypermedia discussed earlier. In encountering hypertext and hypermedia objects in the worlds that computers open up, these "hyper" objects are not typically experienced as initiating action or acting independently upon the user engaged with them. They wait to respond to the mouse clicks and commands of the student, and otherwise tend to be inactive and

inert. But in the case of simulations and other types of interactive phenomena, the world opened up by the computer not only allows the student to engage with objects; these objects are also able to act *upon* the student. Acting in what is sometimes called an "adaptive" manner, they can provide him or her with responses, feedback and other information. And these responses and information can be varied or controlled according to information and inputs that the student provides.

Simulation = (Reality) - (Task Irrelevant Elements)

After I click on the "next" button, I see a red, dotted line running up and down the length of the frog's abdomen. A button with the image of a scalpel appears with the instructions: "Using a scalpel, make an incision from the chin to the posterior of the frog." I click on the button, and am then able to click and drag a scalpel along the dotted line. Soon afterwards, a pair of scissors appears, and I am asked to "cut upwards with the scissors through the muscle tissue." I click on the scissors a few times, cutting along the tissue. But half way along, I am advised to "twist the scissors to avoid cutting the heart under the ribs." To do so, I click on yet another icon, and the scissors slip over to one side before I can continue cutting.

* * *

The class is noticeably excited as the teacher begins: "Settle down! I'm going to take you all step-by-step through the first stages of this dissection." You've all been assigned lab partners, so partner up at your lab table." To my relief, I see that my partner is already putting on the rubber dissection gloves,

> and is starting to work. First, he anchors the pig in the tray with elastic bands. The pig now appears even more helpless with its tiny legs splayed and fastened to the sides of the tray. "Now I want you to switch partners, and have the other one do the incision." "Oh no!" I feel a strange mixture of unease and anticipation. My partner hands me a pair of gloves and the scalpel, grinning slyly. After listening closely to the teacher's instructions, I swallow hard, bend over the pig, and insert the scalpel gently into the spot described in our handouts and by the teacher. Trembling only very slightly in my hand, the scalpel slides in easily. Very gently holding the pig's body in my other hand, I begin to slowly and carefully guide the scalpel up the length of the abdomen. I notice some resistance, and just then, I hear the teacher's voice reminding us: "don't cut too deep!" Almost as a reflex, I jerk the scalpel back, and begin to worry that I may have cut something I shouldn't have.

In both the simulated and the "real" dissection activities, it seems clear that special care must be taken in the initial stages of the dissection process. In the online exercise, I am instructed to turn the scissors onto their side "to avoid cutting the heart under the ribs." And in the physical classroom, I am concerned that I may have cut too deeply, perhaps severing something beneath the skin.

But there are a number of reasons why the care that is taken in the online dissection is quite different than that involved in the classroom. Online, even though I am asked to take care to "twist the scissors," this involves a mere mouse-click. No one mouse click or keyboard stroke is necessarily more gently or skillfully executed than any other--as far as a computer or a software simulation is concerned. In fact, with

the online dissection, there seems to be no chance of making an error with the incision or with any other part of the dissection activity. If one clicks in a wrong place, nothing happens; even if one takes a wrong step, there are "back" or "undo" button commands, allowing the student to redo an earlier step.

In fact, there is no *real* risk involved in the online dissection--except perhaps the risk of the browser or the computer freezing or crashing. In the classroom dissection, on the other hand, consequential and irreversible errors *can* be made. Patient caution and care are important. There is a distinct risk of cutting too deeply, or cutting in the wrong place. And once a cut is made, it cannot be undone. Dissection in the classroom--as in a medical laboratory--is an act of taking apart in which there is no possibility of putting things back together again. The processes by which the dissected animal was "put together" are very different from the processes of cutting and taking apart. Dissection in the lab is an irreversible and ultimately destructive activity. Perhaps this is part of the reason why the act of cutting into the body of the pig produces a different and much more emotionally charged response to the task of clicking and dragging with the mouse to "virtually" dissect the frog.

In much of the literature that discusses the effective use of simulations, these and other differences are all characterized in very particular terms. Specifically, the differences that separate simulations from their real-life counterparts are identified as "task irrelevant elements." Jacobs and Dempsey explain this as follows:

> In order for a simulation to be effective, two basic issues must be addressed: (1) what aspects of the operational environment require simulation, and (2) to what extent should they be replicated? The supposition we make is that one only needs to simulate those events or characteristics that allow the learner to perform in a proficient manner when performing in the operational environment, i.e., the real world. This representation of the characteristics of simulation have been characterized by Gagné (1962), and later by Clariana in the following formula:
>
> Simulation = (Reality) - (Task irrelevant elements).
>
> (1993, p. 200)

More colloquially, these task irrelevant elements are described by instructional design experts Smith and Ragan as "deadwood"--something which must presumably be carefully pruned and disposed of (1993, p. 65).

Wonder and Amazement

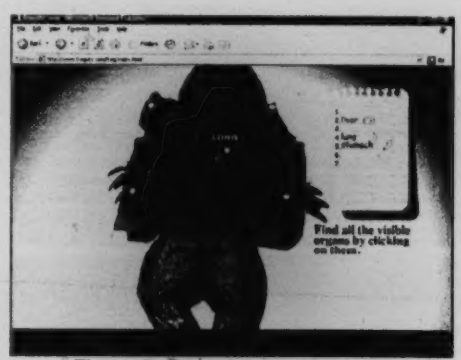

Figure 7: Organization of organs

Following a few more steps, I have revealed the internal organs of the frog. My cursor now turns into a magnifying glass, and I am able to zoom in on its abdomen. A label appears for each organ as the magnifying glass passes over it. As I click on each of the labels, the organ's name is added to a list in a small

notebook on the right side of the simulation window. I am impressed at the how well this part of the assignment seems to work. I also notice that the textures and colors of the organ are varied, but they all seem uniformly wet and slimy.

* * *

After I have carefully cut four flaps of skin, my partner takes over, and "teases away" and "reflects outward" the skin flaps (as it is put both by our teacher and in our handouts). As my partner begins pulling back the first flap and revealing the lower abdomen, I am amazed at what I see: tucked away very neatly inside, about the size of a marble, but wet and glistening, is the small intestine. It is tightly wrapped into a pink, wrinkled ball; and I know from our reading that if it were uncoiled, it would measure 20 feet in length!

In both of these descriptions, the activity of dissection (simulated or real) leads to discovery, amazement, and even surprise. In the case of the simulation, I am impressed at how carefully the program has been set up to allow me to find and identify each of the frog's main internal organs. In the classroom dissection, I am impressed at how the internal organs of the pig are formed and how neatly they fit together. However, online and in the classroom, the cause of this amazement is quite different: On the computer, it is the simulation itself that is impressive. In the classroom, it is obviously the body of the pig that is the object of amazement: the intricacy of its internal organs, and the way they are packaged or almost "folded" together.

It is likely that this difference in responses is connected with the respective "origin" or "development" of the two things being dissected. In the case of the pig, this development is not the product of planning, intention or of a human decision process. Instead, it occurs in the darkness of the womb, hidden from and independent of human artifice. What is being revealed in the animal dissection, in other words, is the result of something other than a teacher's or designer's plans for the student's learning. It is the reality and intricacy of the creature or organism itself. And what is brought to the fore are the forms of organization, operation and life proper to an organism--something very different from what can be attributed to a computer or a computer program.

It is likely that these different responses are also closely connected to another factor separating the simulation from its counterpart in the physical world--namely the absence of life and of the potential for life. It is precisely the *absence* of life--of movement, of any capability for self-preservation--that is conspicuous on a first encounter with the pig. This is registered most clearly in descriptions of it as "inert," "listless" and "helpless," and may also play a role in the "trepidation" and "unease" that are experienced while dissecting it. By contrast, in engaging with a computer or with computer software, it comes as no surprise that the objects encountered are not alive--or that they do not present the potential for life. Despite their interactive nature, these representations do not surprise me by simply being inert and still. It seems unlikely that one would be surprised by the fact that they are devoid of life and feeling. But in the classroom, the fact that the fetal pig was once a living

organism--or at least had the potential to live--is of undeniable importance in the experience of its dissection.

Using the term "microworlds" to designate these computer-generated simulations, Augustin Araya underscores other characteristics of objects found in these computational, networked worlds.

> Microworld objects . . .lack certain kinds of functional and physical properties; for example, they cannot malfunction nor break in the sense that real objects do. Nor do they meaningfully participate in certain kinds of social relationships; for example, they are not owned by anybody. . . .In fact, this paucity of properties is due to a fundamental characteristic of these objects; namely, that they are disembodied objects. Whatever few properties we perceive of them, they do not emerge from their bodies, which they lack; rather they are computed and displayed [only] in a particular region of space and time, the computer display. (1997)

According to Araya, the confinement of these objects to the computer screen--along with their other limitations--points to a profound, categorical distinction that separates any simulation from its counterpart in the physical world. He describes this as a difference in "ontological status" or "character" (Araya, 1997)--a qualitative distinction in the "being" of simulations, or in the way that they simply "are." Borgmann states that as a result of the intrinsic character of these "hyperreal" worlds of simulation, they are by definition "disposable and discontinuous" (1992 pp. 95-96).

> To be disposable, hyperreality must be experientially discontinuous with its context. If it were deeply rooted in its setting, it would take a laborious and protracted effort to deracinate and replace it. Reality encumbers and confines (1992 p. 96).

The encumbrance and confinement of reality, for Borgmann, are not negative characteristics. These are instead qualities that "call fourth patience and vigor in people" (1992 p. 96) whereas in hyperreality, "one can only win or loose. In the real world one may earn affection and gratitude; in the hyperreal framework there are only prizes and acclaim" (1992 p. 99).

As Borgmann and Araya make clear, it is not simply a question of making a more lifelike simulation or an issue of the motivational aspects of learning in a real-life or truly "authentic" situation. It is not something that can be recreated through a more careful "pruning" of instructional "deadwood"--through a more painstaking analysis of elements relevant or irrelevant to the task at hand. What is important is something that cannot be analyzed or separated apart from the experience of a "real" dissection. It is also not something that can be encoded or transmitted as bits of data. It is an elusive but vital element or quality that will be explored at greater length in this dissertation's next chapter.

Faint Praise Coming from a Computer!

After I identify all of the organs using the mouse and the magnifying glass, the following message appears. "Excellent! you are now ready for a more detailed dissection!" But before I continue with the exercise, I decide to take a break to have lunch and watch some TV. An hour later, I return to my computer, and I see the message still flashing on my computer screen: "Excellent! you are now ready for a more detailed dissection!"

* * *

As the end of the class approaches, we pack up our dissection equipment, and return the pig's body to a plastic bag to prevent it from drying out. On my way out, the biology teacher takes me to one side, and says: "Norm, I noticed that you seemed to be having a difficult time at the beginning of the dissection." I reassure him that I'm doing ok, and he says: "Don't worry, its common for some students to be squeamish at first. You're doing fine. Keep up the good work," he says as he smiles and begins gathering the dissection equipment.

Here we have two instances of what often goes by the name "feedback." In both of these cases, the student has completed a task, and is provided with information on how well the task has been done. But understood in experiential terms, there are obvious differences. Perhaps most clearly, the feedback in both cases is provided in significantly different forms: In the first description, it occurs in written and visual form, and in the second, it is spoken. This results in differences in the temporal

character of the feedback provided--something that will be explored in greater detail in the next chapter. The written feedback is persistent through time, allowing it to be viewed at different moments. Spoken feedback, on the other hand, is much more ephemeral, occurring at one point in time and then remaining only as a recollection.

But of course, there is another obvious difference--namely that the feedback in one case comes from a computer and in the other, from a teacher. The way that computers are able to use language and the way that humans speak and write in everyday contexts are quite different. For humans, providing praise or feedback, asking a question, or providing an answer all have an effect for the speakers and on any others who may be involved in the exchange. When my teacher takes a moment to check on how I'm feeling and to tell me I am doing good work, he cannot be doing something else at the same time, and it is not something he would simply repeat verbatim an hour later. He takes time to reassure me, and singles me out for attention from the other students.

For the computer, however, there is a rather different dynamic. It is sometimes said that "being a computer means never having to say you're sorry" (Art Buchwald, as quoted in Cuban, 1986, p. 97). If a computer crashes, deletes a file, or causes other difficulties for its user, it does not make an apology. It does not do this quite simply because it cannot. To be meaningful, an apology, like any other statement, implies a promise or commitment that an effort will be made to avoid the situation which necessitated the apology. (We have all had the experience of being disappointed by an apology where this implied promise was not kept.) But computers are incapable

of making such a commitment. Just as the computer does not own the objects in its microworlds or simulations, it cannot meaningfully "give" praise or anything else to students who may be interacting with it.

In this sense, offering praise--as is done in the examples above--is rather similar to making a promise. It is not simply a statement of fact, or a description intended to designate conditions in the world. Instead, such a statement can be understood as a kind of gift that implies its own economy of exchange: to be truly meaningful, it cannot be offered all the time or at just any time. To be sincere, it has to be a "gift," and it cannot be presented in direct exchange for something. As an unmotivated act of "paying" a compliment, it affirms the recipient as a person in their uniqueness and individuality. But at the same time, this gift does not necessarily cost the giver anything but a few moments of time and attention. It is also very significant that it is "gifts" and moments of this sort seem to make someone seem "special"--the "dream of every progressive educator" described earlier by Papert.

But a computer is, by its very nature--its ontological status--unable to do these things: to give gifts (figurative or otherwise), or to single someone out for attention as a matter of meaningful choice. Winograd and Flores explain that computers "are incapable of making commitments and [therefore] cannot themselves enter into language" (1986, p. 60). Instead, as these authors go on to explain, the power of computers lies elsewhere: "Their power as tools for linguistic action derives from their ability to manipulate formal tokens of the kinds that constitute the structural elements of language (Winograd & Flores, 1986, p. 76).

Because they and their microworlds are separated from our world and our language by an ontological gap, computers cannot fulfill some of the educational promises that are ascribed to them. They cannot provide, as Papert says, the "learning environment of the future," in which "every learner will be 'special'" (Papert, as cited in Tapscott, 1998, p. 146). However, as Winograd and Flores indicate, these technologies *can* serve powerfully as a way of dealing with "the structural elements of language." They can be very effective in presenting and transmitting written language, and in allowing for its effective composition and revision. And such language can be used to express promises and other meaningful statements that *can* imply the commitment of their human users. This is what I explore in the next chapter where computers and networks are understood as opening textual "worlds" where we encounter others through writing.

Encountering Others: On and Offline

Body, Time and Space

Classroom Conversation

Article No. 1: posted by Andy Smith on Thu, Sep. 3, 1999, 18:34
Subject: Welcome!

It's a crisp, fresh October morning here as I write this message. The ground is covered with golden and brown leaves, and I can see the steam rising from the river through the window of my 2nd floor study. However, inside it is nice and warm. It is a similar, comfortable warmth that I hope to extend to you through this message. I want to welcome you all to the first week in our course, and to our online discussion forum!

I've been an instructor in English literature for five years, have a Master's Degree in English literature, and am currently working on my PhD. I've taught this course a number of times before, and each time with about 20 students. Every time I teach it, I learn more about English literature from my students. I hope through this course to learn more about my readings and about who you are –and to help you as much as I can with your writing skills and knowledge of English literature.

For our first assignment in the course, I am asking you to reply to this message (by clicking on the "reply" link at the very top of the page). Please introduce yourself as I've just done, telling everyone a little about your

academic background and interests, and also your main aspirations or goals for this course. In this way, I'm hoping we can all begin to develop a fruitful and supportive online community. I'm looking forward to getting to know all of you!

Warmest regards,

Andy Smith

* * *

I glance around as I enter the classroom. Many of the seats are taken. I find a spot in the first row, and quickly sit down. I see that the instructor is handing out copies of the syllabus, and there is a buzz of anticipation in the room: Many students seem to know one another, and to know the instructor. She makes her way to the front of the class, stands almost directly in front of my seat, clears her throat and begins: "Welcome, everyone!" she announces loudly. The commotion in the classroom gradually settles.

"Welcome. As some of you know, I'm Ms. McCormick. I'm glad you could make it to our introductory course in English literature. In today's class, we'll start by learning a bit about each other, then we'll have a look at the course syllabus –the assignments, marking, readings. Finally, I'll divide you into groups and ask you to read and comment on a short discussion piece. I'm hoping that we can then have what will be the first of many fruitful and interesting class discussions."

Classroom dynamics and discussions are matters that are often of great concern to faculty, instructors and teachers. Experienced teachers know that the way they are able to conduct and sustain a discussion is often a decisive factor in students' engagement and success. The energetic and mutually respectful exchange of opinion can help to involve and motivate students as little else can. And the potential quality of this discussion often begins to show itself during the first few, crucial classes.

The literature of educational technology would regard the two illustrations provided at the outset of this paper as instances of class discussion. The first of the two is an illustration of an online or Web-based discussion, sometimes referred to as an "asynchronous" and "text-based computer mediated communication" or "CMC." These technologies are also called "learning networks;" and in a book-length study of the same title, their potential benefits are described as follows:

> Imagine learning with peers, expertise, and resources that are available whenever you want or need them. These "classmates" [may be] from Moscow and Mexico City, New York and Hong Kong, Vancouver and Sydney--from urban centers and rural and remote areas. And they, like you, never need to leave home. You are all learning together not in a place in the ordinary sense but in a shared space, a "cyberspace," using network systems that connect people all over the globe. Your learning network "classroom" is anywhere that you have a personal computer, a modem, and a telephone line. . . .

> Dialing into the network turns your computer screen into a window on the world of learning. (Harasim et al, 1995, p. 3)

The network, in other words, is a classroom in a shared medium called cyberspace, with classmates who may be from all over the world, yet are all still at home. But what kind of a "classroom" is this? Can students really "be together" if they are sitting at home--in places as far apart as Moscow, Mexico and Sydney? How are they present to one another in such a "network-classroom?" Is this presence really similar to a physical presence in the "non-virtual" space of a conventional, physical classroom?

Of course, there *are* differences, as the descriptions provided above clearly illustrate. In the first description, we read a message that is full of warmth and encouragement, and that attempts to reach out kindly to students, and thus create a sense of community. But in reading the description, there are only two people of whom we are directly aware--the teacher who is writing, and the student who is reading. In the second description, the teacher and a large number of students are physically present in the evidently more crowded setting of the physical classroom. In this context, issues compete for attention that are apparently tangential to learning and to the subject at hand--things such as seating, class order and ambient noise. But with some effort, the teacher is able to direct attention to herself and bring the class to order.

In much of the copious literature discussing CMC, the difference between what is called the "networked" or "virtual" classroom and its conventional, physical counterpart are understood as being one of degree or of emphasis. Either explicitly or implicitly, what happens in both settings is understood as "communication," which is in turn analyzed in terms of sender and receiver. It is also understood in terms of the information transmitted between them, the characteristics of the channel that carries this information, and an encoding and decoding process that allows this information to be both transmitted and understood (see, for example, Walther, 1996; Pea, 1994). In his overview of the literature of computer-mediated communication, Joseph Walther describes how this transmission or mediation is understood as involving the "filtering out" or "limiting" of these cues through the constraints (or "bandwidth limitations") of a particular channel (1996, p. 6). Because text-based communication, for example, does not transmit audible tone or visible gesture, it is seen as "limiting" or "filtering out" these particular signals or cues. Meanwhile, audio-visual communication media are understood as providing greater "bandwidth" for these same signals or cues, and therefore a higher "ranking" or degree of "presence" (Lombard & Ditton, 1997).

But can the differences separating these two types of experience be sufficiently understood in these terms? Is there something that might be lost, gained or significantly changed when communication is mediated by technology--something that can't be accounted for in terms of "transmission" or "bandwidth?" It is questions such as these that I hope to answer in the sections that follow, especially those under the heading of "Relation."

Body as Positing

Later that day, I check the online forum again to see if anyone has posted a response to the instructor's message. I see that there is another message apparently sent by Dr. Smith. I click on it and read:

> *Hi!*
>
> *My name is Jayne Spencer. I am Dr. Smith's teaching assistant in this course. I will be participating in the discussions and will assist Dr. Smith in marking some of your assignments.*
>
> *I have been studying as a grad student for a number of years, and am looking forward. . .*

I read on, but I am confused. Why is the teaching assistant writing as Dr. Smith? Is it actually Jayne Spencer who has sent this message? I wonder what the other students are thinking, but I don't know any of them. I decide I will wait and see what happens. I sign off.

The next day, another message has appeared from the instructor.

> *No - I was not replying to myself - This is Andy writing now!*
> *Jayne Spencer (my teaching assistant) and I have been using the same account to set up this forum and we now realize that we both can't use this account to participate in it.*

To avoid confusion in the future Jayne will be logging on using a student account of her own.

Sorry for any confusion.

Andy

* * *

Ms. McCormick continues her introduction to the literature course: "Oh, yes, and before we begin, I just want to let you know that for anyone who might find themselves in the wrong classroom or the wrong course, this would be a good time to leave and find the right room." As I wonder why she's saying this, I notice that she is looking and smiling at a student in the front row who appears rather flustered. It all suddenly makes sense as he shoots a nervous glance at the room number above the door. He blushes, and almost crouches as he quickly scoops up his books and makes a bee-line for the door.

Here are two cases of mistaken places and confused roles and identities: In the first, someone logs on to the forum or "virtual classroom" using the wrong user name and password. In the second, a student shows up in the wrong classroom for a course.

The differences that separate these two instances reveal some of the more general differences separating a virtual classroom from a physical one. These incidents show how each setting--real and virtual--stake out widely varying possibilities and conditions for those participating in them.

The first incident seems to revolve around the fact that the wrong name was associated with the message sent to the forum. The explanation of the professor seems to confirm this. It singles out the issue of the "account" (or student or instructor accounts), and the act of "logging on" as being the critical factor: "we now realize that we both can't use the same account. To avoid confusion in the future Jayne will be logging on and using a student account."

It is the "account"--an individual's user name and password--that guarantees his or her identity in a text-based, online forum. This account, in turn, determines the name appearing along with each message. And it is the name associated with an account that most explicitly identifies discussion participants to one another. It is telling that the word "account" also means or implies "consideration" and "careful thought," responsibility ("a statement explaining one's conduct")--as well as designating a business and record keeping "arrangement" that can be computerized (Merriam-Webster, 2000; Microsoft Press, 1997).

In the classroom, many of these same functions are provided by a combination of factors so mundane that we tend not to notice them: bodies, time and spaces. These terms are not to be understood in the abstract sense of science and physics, but in an almost painfully obvious, commonplace sense: The classroom, as a place or context for learning, is not a place in which access is controlled through user name and password. We get access to this classroom space through the door, not a code. And it is our *body* that provides us with access to it, and that "authenticates" and

"accounts" for our presence in it. It is also our body, moreover, that identifies us to others both inside and outside of this classroom space. Indeed, our bodies are the medium through which we always reveal our identity in these physical settings. In these contexts, we do not differentiate between the person's identity and his or her body.

Merleau-Ponty describes the body as having a "positing" character: it is, he says, "our anchorage in the world." A person "is his body, and [her] body is the potentiality of a certain world" (1962, pp. 144, 106). Our bodies, in other words, are the "medium" (1962, pp. 146) through which we both experience the world and reveal our identity.

In the context of an online forum, however, there is no physical body--and no physical space within which the body would "posit" and position itself. In front of the computer screen and the in virtual space offered by the conferencing software, there are only names with absent owners.

When is Anytime?

> *Professor Smith's eloquent online introduction--and the subsequent confusion caused by his teaching assistant's message--takes me aback. How should I enter into such a discussion? Can I come up with something that is even nearly as eloquent as what the professor has written? I decide to wait for a day or two. The next time I log onto the online forum, I see the following:*
>
> ***Question*** *[Forum: Week 1 Discussion]*
> *1. Andy Smith (Sun, Sep. 2, 1999, 10:34)*

2. Andy Smith (Mon, Sep. 3, 1999, 16:12)
3. Andy Smith (Mon, Sep. 3, 1999, 19:44)
4. Maria Plummer (Tue, Sep. 4, 1999, 10:50)
5. Diane Hayes (Tue, Sep. 4, 1999, 14:47)
6. Dan Merceau (Wed, Sep. 5, 1999, 20:14)
7. Gabriel Rifon (Wed, Sep. 5, 1999, 20:18)

I click on the names to read each of the messages.

* * *

"Now that I've said a bit about myself and the course, I'd like you to tell me a bit about *yourself.* Please say your name, what you might bring to the course in terms of experience or background, and what you hope to get out of it. I'll start at the back with you," the professor announces as she gestures towards a young student in a baseball cap who is just seating himself in the back corner. All heads turn around to face him. The student, who must have snuck in late, appears to have been caught by surprise. He fidgets nervously, and mumbles "Uh, I'm Stephen Draper; I'm majoring in science, and, uhm, I have to take this course as a part of my pre-med requirement; all of the other classes were full." A few in the class giggle quietly and nervously at this unexpected response.

It is important to get to class on time; there is a great deal of emphasis placed on this simple rule or convention. But it is more than a formal exercise in discipline and order. In the context of a classroom full of students, the importance of being on time reflects an obligation not towards any one person, nor simply to the instructor or to

simple conventions. Instead, it is part of a responsibility to *everyone* who is present. It reflects an important fact about classroom experience that is often denigrated as a disadvantage when the classroom is compared to CMC technologies; namely, the fact that one can use these technologies to communicate from "anywhere" at "anytime"--rather than the "same place" and "same time" enforced by physical presence of the classroom. (See, for example, Graves, 2000; Spender, 2001)

Having to be at the same place at the same time, however, is more than just an inconvenience--or something that may be artificially enforced through course attendance marks or requirements. It is a condition that profoundly affects the experience of the classroom. It implies a commitment and sacrifice on the part of everyone who is present. Those who are present cannot be somewhere else at the same time. Each has sacrificed his or her time and freedom to be in a specific place at a specific time for a common purpose. This also places a considerable weight or responsibility on the person who is to ensure that this time is spent wisely. The teacher or instructor has the significant opportunity of directing everyone's attention as a collectivity to a single subject, person, or event. If this potential is not utilized properly or fully, the results can be quite negative. Surely any university graduate can recall classes where one could easily think of better things to do with one's time. But the potential that this collective commitment and common focus present, and its confirmation through each well-attended class--perhaps especially at the beginning of the course--is one of the first and most significant of many tacit, unarticulated but powerful realities of the classroom.

Of course, with the features of "anyplace," "anytime" communication often advertised as substantial advantages of CMC technologies, a communal "inconvenience" or sacrifice for a common purpose does not exist in the same way. Students can read and reply to messages when it is convenient for them, independently of where they live, or when they might be accessing the forum.

But if they are posting and reading at "anytime," when are they actually focusing on the "discussion" that is supposed to be taking place? As the incident described above shows, in the common space of the physical classroom, events and discussion contributions occur in a "present" or a "now" that is shared by all, and unfolds in linear progression. Students are asked to introduce themselves one by one, according to their position in which they are seated. They are not all introducing themselves at the same time. They are expected to be silent when others are contributing or the instructor is leading.

However, in CMC contexts, this single, mutual, unfolding present generally does not exist. Two or more participants can contribute almost simultaneously; or someone can wait for days or even weeks before contributing. In a certain sense, each participant in this forum can be said to inhabit his or her own temporality, not sharing a common "present" that unfolds in a linear progression with the rest of the class. The temporal independence of each user that is possible is evident in the common problem of remaining "caught up" with the contributions in a forum mentioned in the third chapter. The temporal scale that seems to govern this context is one that is measured over days or even weeks. This is very different from

classrooms or other face-to-face situations, where even seconds between a question and response can seem like a very long time. As will be explored further below, this difference in temporal character makes commonplace communicative phenomena such as silence, timing of remarks and humour very different on and offline.

Where is Anyplace?

> *As I read the messages in the listing, I find myself double-checking the names of the people who sent them, in a deliberate effort to associate the contents of each message with its author. From the introductions, I see that the students are from different parts of the country and, indeed, the world. Scanning the listing of hyperlinked names of active contributors, I see that there still must be a dozen or so students who have not yet posted. I also notice that the last two messages were sent in the last couple of minutes. I decide that there's still time to wait and find out what else happens before posting my own introduction.*

* * *

> But as soon as Stephen Draper finishes his introduction, the student sitting next to him jumps in: She turns to the class and smiles broadly. Brand new copies of the course textbooks are stacked neatly on top of her desk: "I'm Gloria Gillespie; I took Professor Grant's introductory course last year, and really enjoyed it. I'm hoping that this class will be just as interesting."

The classroom presents a clearly-defined space in which terms like "next to" and things like seating order have fairly obvious and unambiguous significance. In an online forum, none of these factors are quite as clear. In this context, students are, in effect, in two places at once. They are always necessarily located bodily in front of a computer, in Canada, Mexico, Hong Kong, in a home, a computer lab, cyber-cafe or anywhere else. At the same time, regardless of their location, they are also accessing and focusing their attention on the same words and the same list of messages and message contents. In such a situation, there is a simultaneous duplicity that is not the case in the classroom: On the one hand, the student is an interlocutor or a participant in the forum--communicating with others in Moscow, Sydney or elsewhere--and on the other, he or she is at a single physical location using a computer. The participant and computer user can be interrupted by events completely unrelated to class in their immediate physical surroundings in a way that can't happen when in the confines of a classroom: Writers in online conferences sometimes mention in their messages that they are being interrupted by a spouse who is talking in the same room or by children who are hungry for supper. At the same time, one can be perceived as being absent to others in this immediate environment. When one student was engaged in an online forum for a course hosted in Canada, her children would say that she was off again in "Canada," in a place where she was unavailable to them--yet she was still physically present in their immediate environment.

The one thing that they all share in common, however, is the messages sent between them: the text of the messages, and the way that these messages are ordered and presented in the message listing.

The Sound of Silence - Online and Off

I check the forum again a few days later, and a message from a "new" student, Rachel Schrader, appears:

> *Ok. Time to stop being a lurker and jump in. This is it! I have just been trying to figure out this new conferencing system. I became somewhat confused about the structure of the discussion. But now I know which message I should be responding to - I think.*
>
> *I've been a secondary school teacher for about three years, and I'm glad to be in this course to learn more about. . .*

* * *

The introductions in the class continue. An older man with a thick accent says he is taking the class to get back into university, and to learn to study again.

Gradually, the students introducing themselves get closer and closer to the place where I'm sitting; as my turn quickly approaches, I begin to flick my pen in my hand nervously. I scramble for a few simple words to say about myself. Before I know what's happening, all eyes in the classroom are upon me, and

> a silence falls as everyone waits for me to say my name and introduce myself.

The act of "delurking"--of ending one's silence in an online forum, and posting a first message--is clearly very different from making one's first contribution in a classroom. This difference can be understood by returning to the theme of the body and its presence: Even if one is silent in a classroom, one is still bodily present. The physical presence of the body in the classroom involves sharing that same space with other students and the instructor. This "sharing" implies a certain attentiveness, an openness to participation, and even a certain vulnerability. In a class, I can be addressed and asked a question, if not by the instructor then at least by my neighbour. This address or question, moreover, can be directed in kindness, indifference, or even hostility. And any question or address seems to demand a reply. A response of mute silence can, in a matter of seconds, quickly appear to be intolerable or absurd. All people bodily present in the classroom share this obligation and vulnerability.

Silence online, however, is a very different matter. As Andrew Feenberg explains,

> silence [is the] only tacit sign we can transmit on a computer network. . . [This is] a message that is both brutal and ambiguous, far more so that the subtle uses of tone of voice, expression, and gesture on which we normally rely. (Feenberg, 1989, p. 268)

In online silence--when one does not, for whatever reason, contribute to a forum--the body is not present to indicate one's obligation or one's implicit willingness to participate, to be open, trusting and vulnerable. Consequently, the act of *not* contributing online is much more ambiguous and can easily be interpreted in negative terms. In addition, with some conferencing systems, it is impossible to tell whether a silent student has accessed the forum at all. The listing of messages often does not let the student know who has read the messages, or which contributions have been read repeatedly or ignored by the others. It is also impossible to tell whether a student's failure to contribute to the discussion is due to technical difficulties, lack of time, withdrawal from the course, illness or to other circumstances. This is perhaps why the idea of "lurking" is so significant in these online settings: *The Webopedia* (2002), an online computer and Internet dictionary, defines lurking as the act of "eavesdropping on a chat room or conference." In common usage, this term carries a clearly pejorative meaning—Webster's dictionary identifies one meaning as "lying in wait, especially for an evil purpose" (Merriam-Webster, 2002). However, given the connotations this term carries on the Web, lurking is not always viewed as negative. As *The Webopedia* explains, lurking allows participants to "get the feel of the area before posting" their own comments.

However, without posting a message to an online forum, it is practically impossible for a person to be addressed directly in the discussion. If I do not post a message, then a linked reference to my name will not appear anywhere in the conferencing area, and there will be no "mail" or "reply" buttons appearing above it that would allow others to address me. When I am "lurking" I therefore do not share the same

vulnerability or openness to being addressed as those do who have already posted to the forum. At the same time, everyone in the conference is still led to suppose that I am able to see everything that they are doing and saying. As a lurker, I am able to read messages online, but I am effectively concealed, and I provide no indication as to the reasons for my concealment.

Silence in a physical classroom, however, is not devoid in this way of indications of its causes and its possible significance. Voice, expression, gesture and other aspects of face-to-face situations can give meaning and determinate character to silences that they cannot have online. Feenberg, for example, speaks of "subtle uses of tone of voice, expression, and gesture" as contributing significantly to nuances or meanings of pauses and silences (1989, p. 268). As a further illustration, Otto Friederich Bollnow describes how silences at the gradual conclusion of a conversation can be richly expressive of a variety of meanings, feelings and actions. These can include

> reflection on what has been said and on what remains to be said, [or] even merely a feeling of gratitude for the profundity achieved in the conversation. And when the conversation finally does sink into silence, it is no empty silence, but a fulfilled silence. The truth, not only of the insight that has been acquired, but the truth of life, the state of being in truth that has been achieved in the conversation, continues to make itself felt, indeed becomes deeper, in the course of this silence. (1982, p. 46)

The combination of silences, "subtle uses of tone of voice, expression, and gesture," in other words, can say as much as--and perhaps even more than--what is explicitly articulated: Stephen Draper's mumbling and fidgeting introduction, and his position in the room, for example, say as much about him as his words themselves. Similarly, the fact that he is the first student to introduce himself, and that all eyes are on him (and on the other students as they take their turns), wordlessly but clearly shapes and colours the situation in other ways. Terms such as "obligation," "invitation," "pressure," and "disclosure" may help to characterize aspects of this situation, but do not do so exhaustively. What we could say about a similarly laconic student online tends to be confined to a series of vague conjectures: he or she might be busy with other work; he or she might have computer problems, or might even not care about the course or about what anyone else has to say.

In the physical classroom, elements such as age, appearance and accent are also factors. These characteristics, for better or for worse, are associated with one's identity. The intimacy of this association is, of course, closely related to issues of prejudice that can arise through visible markers--skin colour, gender, accent, etc.--that are sometimes said to be rendered invisible online. However, these same characteristics are foregrounded and sometimes celebrated, for example, in acting and dance. Choreographer Merce Cunningham speaks affirmatively of how "we become ourselves in our walk and in our speech" (Atlas, 2001). Echoing Merleau-Ponty's observations of the positing nature of the body, Cunningham also states that "you don't have to convince others through the way you walk, you just do it" (Atlas, 2001). We call all remember friends, colleagues, teachers and others for whom a

characteristic gesture, a turn of phrase, or another element of a style served as a kind of personal "signature"--seemingly inseparable from the person, and immediately identifiable as belonging to him or her.

At the same time, these dimensions of personal identity and general feeling and atmosphere are formed by more than just body and voice--however important and multifaceted these may be. Each student's seating position in the classroom, the clothes each is wearing, the neat stack of new texts on Gloria's desk and other incidentals: together these weave a rich tapestry of detail; they contribute to a general feeling. And as they relate to any one student, these details contribute to his or her identity. These incidentals are full of meaning and meanings, but none of these are explicit meanings; few are typically composed, constructed and edited as meanings, as is the case with written sentences. They are very different. By comparison, the only incidentals in online forums--other than what is explicitly said--are times and orders of posting, the "brutal" ambiguity of silences, and (possibly) an accident such as the misdirected message described above.

Con-tact and Con-text

So, it is important to ask: What is the significance of these details of silences, gestures, and glances that are so easily regarded as incidental to the physical classroom? What is their role in pedagogy? If they are important, how might one make up for their absence online, and seek to cultivate a sense of presence in disembodied contexts?

Van Manen closely associates precisely these details of silences, gestures, and glances as constitutive of what he calls "pedagogical tact." This "tact does what it does," van Manen explains, "by using the eyes, speech, silence, gestures as resources to mediate its caring work" (1991, p. 173). In further describing the phenomenon of tact, van Manen uses a conventional definition as a starting point--"a keen faculty of perception or discrimination likened to the sense of touch" (Oxford University Press, 1989). He then defines its pedagogical manifestation as follows:

> Pedagogical tact is the active alertness, sensitivity, and flexibility that educators demonstrate when they are dealing with [students] in everyday educational situations. Teachers who have a high degree of pedagogical tact distinguish themselves for being able to say and do just the right things with students in situations that are always particular, sensitive, always unique, never quite the same. (2003, p. 1)

In the personal relationship of leading and following between student and instructor that is constitutive of pedagogy, tact can be described as an important means through which this guiding occurs. Like a person's ineluctable and characteristic style, gesture or way of speaking, tact is emphatically embodied and tied to the individual.

> Tact is not a skill we use, it is something we are. Thus, when we speak of the embodied thoughtfulness, mindfulness, heedfulness of tact we point at the

> way a person is in mind and body. Tact is a kind of embodied-knowledge that resembles bodily skills and habits. (van Manen, 1991, p. 207)

But as illustrated above, writing gets rid of the body, and replaces it with the body of the text. To the biological body is counterposed a textual one. Clearly, if tact is a question of a mindful, heedful action that occurs through glance, touch, gesture, then its ability to work in an online context where students and teachers do not see one another, and may wait hours or days for a response is limited.

But can some degree of tact be manifest through this textual corpus in a way that is comparable to its manifestation through our bodies?

Perhaps there is a tentative and provisional, shared present and presence that is sometimes manifest or possible in online contexts. Tact and contact might be possible in the context or setting of the text itself. We do not speak of writing as manifesting a meaningful glance, touch or gesture. But we *do* talk about writing as being capable of demonstrating a particular and personal "tone" and "style."

To address this difficult question, it is useful to look at a longer example of writing occurring in a pedagogical situation. It represents an exchange between a grade nine language arts student and her teacher that takes place as farewells are made at the end of the school year. The student in question had distinguished herself through academic and other awards, and her note was accompanied by a small gift--the only one she gave that year to any teacher in the school. Significantly, the exchange is

situated in a face to face context. And perhaps not surprisingly, it begins by underscoring how important glances, smiles, gestures and other aspects of embodied tact have been in this pedagogical situation:

> Dear Mrs. Bergson, although throughout the year I had feelings that I was not your idea of a great student, and that I was not one of the many students that you shared meaningful smiles and glances with, I nonetheless want to thank you. I realize that you care about your students and want them to succeed. I greatly respect you for that and also because it seems like you love your job. You deserve more credit than this, but alas, I am at a loss for words.

Mrs. Bergson responded in a letter as follows:

> Dear Marian, I appreciate so much your honesty in sharing your personal thoughts with me. You stir me to reflect about my teaching style and my way of relating to students. As a teacher I was continually drawn to your sensitive intelligence, your many talents, creativity, and devotion to your studies. But I was never quite sure just how to develop a more personal relation with you in class. Maybe I felt that because of your outstanding work and accomplishments you did not require or value the small prods and meaningful smiles and glances. I sensed a kind of reserve that I felt I should not overstep. I now know that I was wrong and that I should realize that as a teacher I need to risk more and not be afraid of being rebuffed or perhaps in going too far in seeking closer teacher-student relations.

> I truly regret that we both feel that somehow we were not able to develop a more satisfying teacher-student relation. I feel this as a genuine loss that cannot be recovered. . . . And yet, your kind gesture and your thoughtful reflections have broken through my mistaken sensing of reticence in a way that I find very valuable.
>
> I will continue thinking of Marian as a highly gifted and sensitive person with whom some meaningful "smiles" were exchanged by means of these notes--even though it was only at the very conclusion of the school year. (van Manen, 2003)

This humble exchange expresses powerfully how the teacher and student are in a relation of great significance. It also makes clear that in the sometimes hurried and pressured environment of the classroom, it is not always possible to realize the opportunities that it provides. And this, of course, extends to the meaningful gestures, glances and smiles that can be exchanged in such a setting, and that are so important in the dialogical, pedagogical relation of guiding and being led.

At the same time, however, it also illustrates the potential of writing and a written exchange: It shows how the repose, reflectiveness, precision and clarity that writing can accomplish purposes that would be difficult to achieve through spoken words alone: Both student and teacher are able to engage in meaningful but careful self-disclosure, and give precise expression and qualification to their thoughts and feelings that would easily be diluted or diffused by the immediacy of a face-to-face

exchange--its temporal immediacy, its confinement to a single spatial and temporal locus, the expressive sententiousness of its unplanned pauses and silences. What is more, the teacher states that she will remember the student as a person "with whom some meaningful 'smiles' were exchanged by means of these notes." It seems to suggest that such embodied forms are transferable into writing, in however attenuated a form.

Relation

Self-Presentation through Speech vs. Writing

Realizing that just about everyone in the online forum must be sharing some of my insecurity, I decide that I too will take the plunge and "delurk:"

Hiya,
my name is Norm Friesen, and I have had a number of years of experience using the Web and training others how to use it in different settings. Earlier, I worked in a variety of educational settings, including university and college libraries, schools classrooms and elsewhere. I've taken a number of humanities courses in the past that combine CMC and F2F communication...

After finishing my introduction, I re-read it and see some problems: "Hiya" sounds too informal. I change it to "Hi;" "settings" is repeated too often, so I try to vary my wording; "CMC" and "F2F" might be unfamiliar to some readers, so I simply say "online humanities courses." Finally, after reading it one more time, I send it off, clicking on the "post" button.

* * *

Everyone is waiting for me to speak, and the silence is quickly becoming embarrassing. I move uneasily in my seat and clear my throat: "Um, I'm Norm Friesen. I've taken some, er, other courses. . . I mean language and

philosophy courses, and am interested in taking more like this. Um. . . That's it, I think."

In face-to-face settings, it seems that people vary widely in their abilities to handle being put "on the spot." For some people, it is easy to become nervous, and to have the best planned lines come out sounding wrong. Other people, however, seem to be comfortable at taking advantage of such situations, and exploiting things like timing, humor and tone in ways that can be difficult to accurately characterize or reproduce.

Online, things are different. A person's ability to introduce himself or herself appropriately, depends almost exclusively on his or her writing ability. This is not necessarily the same kind of writing that one might encounter in a formal essay or assignment, but it is still written expression nonetheless. As the description above shows, I am able to make changes to my "message;" and depending on my abilities, my inclination and other factors, there is no reason why I could not spend many minutes or even hours composing a message. The author of such a message--unlike a speaker in a classroom--can carefully weigh the tonality or effect of each word, and can reconsider it, withdraw it, and replace it. There seems to be, at least potentially, more choice and opportunity with writing for control, planning and deliberation. Feenberg characterizes both writing and online forums as allowing for "highly controlled forms of self-presentation," and describes this as follows:

> Electronic bulletin boards, dialogue systems and computer conferences present their users to each other only through explicit written language. When writing, it is easier to choose a tone and attitude than it is in speech, dress and gesture. (1987, p. 267)

With writing, one can carefully tailor one's self-presentation. The body, on the other hand, allows and encourages very different forms of self presentation. The body, as well as the voice that emerges from it, is subject to a kind of automatic, unavoidable expression. In the illustration above, this is indicated in my initial, uncomfortable silence, my hesitation between sentences, shifting in my seat, and words like "um," "er," and "I think." All of these arise in a manner that is much less subject to intentional control than in writing. "The body," as Merleau-Ponty characterizes it, "is essentially an expressive space" (1962, p. 146). Emmanuel Levinas refers to this expressivity as the body's "auto-signifying" character. He explains that the simple fact of the body's presence carries with it various significances: "to appear is already to signify," as Levinas puts it succinctly (1987, pp. 120, 112).

Expressive Spaces

> *After sending my first message, I am left wondering how or even whether I will be acknowledged by others in the discussion. Returning to my computer the next day, I hope to see some text on my screen, acknowledging my message. I see that Susan has replied to my message; a link with her name is nestled immediately underneath mine in the message listings:*
>
> *Norm,*

I'm glad to see your name. You sound like a great person! Since you work with computers, I wanted to ask you a question. I am sure you will have an answer to it...

I re-read the first two sentences a couple of times, feeling somehow acknowledged, affirmed and gratified by it. These otherwise plain and impersonal characters glowing on my computer screen speak to me with a certain immediacy. Somewhere at the other end, there is a person who is "glad to see my name" and who says that I "must be a great person!" I wonder for a moment what Susan might look like.

But suddenly I think: Is there something behind her generous compliments? How can she know that I'm a great person from just one message--without knowing who I am or ever having met me?

* * *

Just as I finish the last sentence of my introduction, I turn quickly to my neighbor, and he thankfully begins speaking without a moment's hesitation: "I'm Dave Edwards, and am looking forward to expanding my background in English literature." But now that all eyes are off me, I'm only half-listening; I exhale and shake my head slightly--impatient with my own inarticulateness. However, I am suddenly surprised to hear my name: ". . .and like Norm, I've taken some courses in philosophy and language--mostly ethics and French." Dave shoots me a glance, and smiles as he says this. I make an effort to smile back: I am happy that he has mentioned me, but irked at how his eloquent introduction makes mine look all the more inarticulate.

Even though writing is subject to intentional control in a way that bodily self-presentation is not, it is remarkable how difficult it can be to anticipate or interpret the "real" meaning or import of a message. Sending or reading a message in an online forum can frequently be a fairly interpretive, intellectual exercise. The sender can carefully consider what kind of impression he or she might be cultivating. The receiver can carefully weigh the evidence for arriving at one possible conclusion or another, or can simply jump to a conclusion without being able to confirm its validity. The "expressive space" of the screen can be subject to careful control but it also can give rise to a range of interpretations and responses.

Of course, in spoken situations, interpretation and consideration can be important, as well. As the example of classroom introductions shows, one can have mixed feelings about what someone says, or later recognize the patience, generosity or malice that might underlie someone else's words. However, the temporal immediacy and changeability of face-to-face situations and the ephemeral nature of spoken language itself tend to mitigate this. They make it difficult to interpret, re-interpret and reflect on what is said in the way we can the case of writing. In addition, through responses as subtle as crossed arms, a raised eyebrow, or a kind glance, one can indicate support or disagreement, or seek clarification of another's remarks.

The "auto-signifying" and "expressive" space of the body adds another dimension to the experience of the spoken word in the classroom. Merleau-Ponty explains that the

gestures, dispositions and expressions of the body work in a way that is quite different from the exchange of coded signs that are invoked in understandings of language as "transmission" between "sender" and "receiver." Speaking specifically of the signs of love and anger, Merleau-Ponty emphasizes that the "message" of the body makes itself understood very differently than the exchange of coded signs:

> we cannot say that only the signs of love or anger are given to the outside observer and that we understand others indirectly by interpreting these signs: we have to say that others are directly manifest to us as behavior. (1964, p. 53)

We do not receive a "signal" informing us, in other words, that someone is angered or embarrassed when their face turns red in rage or shame. We share the experience of their pain or their embarrassment without engaging in a "deciphering" process. Merleau-Ponty continues:

> I do not see anger of a threatening attitude as a psychic fact hidden behind the gesture, I read anger in it. The gesture does not make me think of anger, it is anger itself. [. . .] The whole difficulty is to conceive this act clearly without confusing it with a cognitive operation. (1962, pp. 184, 185)

A fumbling or fidgeting silence, an uneasy shifting of the body, a blush--these *are* embarrassment itself. A warm smile, an unfolding of the arms, a friendly tone--these *are* openness. Even though we call this "body language," it works very differently

from language itself: Except in the case of deliberately deceptive behaviour, we do not first think that we want to express unease, and then shift and hesitate in an uneasy manner; we do not first conceive of expressing anger or pain, and then grimace. Similarly, we do not perceive these things in others through "cognitive operations"--by first weighing evidence, then arriving at a conclusion. We simply recognize and know--and sometimes we may feel an echo of another's anger or pain, frustration or embarrassment.

Have we met before?

I type in a cautious but detailed response to Susan's message. The next time I check the forum, I see a message from her:

> *Thank you, Norm. I knew you would help me. I am looking forward to taking a course that has people in it like you! Since English is not my native language, my thoughts have to travel an extra lap before they sound half correct. For my first two messages, I admit that I've asked my teenage son to read it over, to make sure that it is very correct."*

"Now I see!" I think to myself. I feel my vague image of Susan, despite its imprecision, has changed considerably: "A non-native speaker, an older student, and a mother! She seems to be very warm, but maybe comes across a bit too strong because of the challenge of speaking a second language." I find myself thinking of the image of Susan's thoughts having "to travel an extra lap" before she gets them right. I've also had to work and study in a second language, and I know how hard it can be!

* * *

> Once he's finished his introduction, Dave leans over and says quietly: "Glad to meet you Norm! I've heard about you from Dr. Davis in Philosophy. He's mentioned you a number of times." I surprise myself with my witty reply: "It seems my reputation precedes me!" I whisper back.

Getting to know someone through writing or through classroom introductions opens up rich and complex realities that have multiple meanings, connotations, tonalities and possibilities: A broad smile and a tidy stack of texts can suggest enthusiasm and an eagerness to learn and participate, or maybe more a desire to please. Similarly, an awkward silence or nervous fidgeting can communicate fears and insecurities--or maybe just a momentary loss for words. Similarly, in writing, a well-turned phrase, a vibrant image or apparently undisguised compliment can create powerful, positive and warm feelings.

But we might ask why, in the above examples--and apparently in everyday language--do we tend to reserve terms like "meeting" for those occasions where we actually see someone face-to-face? Susan tells me that I must be a great guy even though she has not "met" me yet. Meanwhile, face-to-face, Dave says that he has heard about me from a common acquaintance, and is glad to finally meet me. When asked whether we have met or know someone, and have only encountered them in an online (or even telephone) context, the answer is often qualified: "We've met online" or "we've talked over the phone." Why is it that even though we can have

relationships online that can be very intense and involving, we tend to reserve words like "know" and "meet" for face-to-face contexts?

Our privileging of face-to-face situations seems especially pronounced in educational contexts. Many have argued, for example, that technological and socio-economic developments should have made the centuries-old, or the "industrial model," represented by the school and the classroom obsolete--and that CMC and other digital technologies make much more sense educationally and economically. For example, writing as early as 1984, Seymour Papert boldly predicted:

> There won't be schools in the future. . . . I think the computer will blow up the school. That is, the school defined as something where there are classes, teachers, running exams, people structured in groups by age, following a curriculum--all of that. The whole system is based on a set of structural concepts that are incompatible with the presence of the computer. . . . (cited in Cuban, 1986)

Other sources say that this model was out of date when the information economy was initiated through the launch of Sputnik in 1957 (Davis & Botkin, 1994), or with more recently developed mass-customization in manufacturing (Spender, 2001).

Despite such bold predictions, the ascendancy of the classroom as place for education seems far from over. Instead of decrying the classroom as inadequate, authoritarian and industrial--and as far outlasting its usefulness--we might instead

ask, "What is the secret behind its remarkable longevity and importance as an educational form?"

Perhaps part of the answer to these questions can be found in what philosopher Levinas calls "the enigma of proximity" (1987). Like Merleau-Ponty, Levinas emphasizes the simple fact that we are embodied beings means that we cannot *but* communicate. The mere appearance or presence of others as embodied beings--not as invisible lurkers--is in itself significant. Levinas assigns the term "proximity" to this "auto-signifying" character of a person's appearance or to the simple, ineluctable fact of his or her physical presence.

In effect, Levinas' notion of proximity can be said to develop and expand Merleau-Ponty's notion of the expressive space of the body as one which is not deciphered intellectually, but is instead "directly manifest to us as behavior." Levinas states that "the immediacy of the sensible is an event of proximity and not of knowledge" (1987, p. 116). Indeed, Levinas connects this notion with an entire type of awareness or modality of consciousness. He differentiates between "two distinct modes of consciousness:" an "a-thematic consciousness [and an] objectifying consciousness" (1987, p. 114). The latter he describes as giving rise to "intention," and ultimately, to "a thematizing, identifying [and] universal discourse" (1987, p. 114). A-thematic consciousness, on the other hand, is a type of awareness that is not intellectual, interpretive or deciphering. Using his own language, Levinas explains this as follows:

> Proximity is not an intentionality. To be in the presence of something is not to open it to oneself, and aim at it thus disclosed, nor even to "fulfill" by intuition the "signitive thought" that aims at it and always ascribes a meaning to it which the subject bears in itself. (1987, p. 125)

Unlike the signs of writing, and the world that they can open up, events of proximity--of physical or face-to-face presence or immediacy--involve a different kind of awareness and a different set of possibilities. These are not ones that are controlled by intention that aims at things to find out what they are. It is not one that centers around explicit meanings, themes, and significations--in which objectifying intention and consciousness finds itself fulfilled. Instead, these meanings and themes are ones that by definition remain implicit, mute and beyond conscious differentiation, manipulation and control. They might be considered examples of what Karl Polanyi and others after him have called "tacit knowledge" (1967; Kidwell, Vander Linde, Johnson, 2001). They are most clear in the descriptions above in terms of the expressive domain of the body: in a blush of humble embarrassment, in a smile or in quiet giggles, or a warm tone of voice--and also in nervous fidgeting, frustrated distraction or reticent mumbling.

It is this a-thematic type of awareness, however, that is attenuated through the artificiality of writing and the intentional control that it requires. It is this a-thematic type of consciousness that is one that we often overlook, or perhaps associate with terms like "feeling" or "intuition." It is something that is the result of factors that are by definition not numerable and subject to systemic control. They are something

that we sense and contribute to, but do not know and over which we have little or no power. As Levinas says, "The immediacy of the sensible is an event of proximity and not of knowledge" (1987, p. 116).

Instances of "tact" and of "pedagogical tact," as described by van Manen, can themselves also be understood as "events of proximity"--and "not of knowledge." Echoing this last statement of Levinas, van Manen explains that "tact is less a form of knowledge than it is a way of acting" (1991, p. 127). Like Levinas' notion of proximity, tact is bound up with concrete embodiment: "tact does what it does," as van Manen says, "by using the eyes, speech, silence, gestures as resources to mediate its caring work" (1991, p. 173). It is realized as proximity because it, too, is not planned, nor is it a product of the "signitive thought" that aims at an object and always ascribes a particular meaning to it. As van Manen says,

> It is generally impossible to plan a tactful action or response. . . .In teaching it is often the unsteady, unstable, inconstant, variable moment that requires tactful action of a sort that is essentially unplannable. And these unstable moments are not accidents in teaching but rather are essentially an integral part of teaching. (1991, p. 144)

In this sense, tact, proximity and a-thematic awareness have their essence in the fact that they cannot be known, dissected and reconstructed. One of their essential characteristics is precisely their mysterious unknowability: "The evanescence of

proximity in truth," as Levinas says, "is its very ambiguity, its enigma, that is its transcendence outside of intentionality" (1987, p. 125).

Technology and Pedagogical Practice

Pedagogical Atmosphere

The elusive notions of tact, proximity and a-thematic awareness explored in the previous chapter were all described as arising in the context of the expressive space of the body, and through the experience of face-to-face dialogue. Levinas, however, indicates that events of proximity can also arise in other ways--namely, in connection simply with the "sensible" or "sensed" in general: "The immediacy of the sensible," he says, "is an event of proximity and not of knowledge" (1987, p. 116); or "the sensed is defined by this relationship of proximity" (1987, p. 118). The events of proximity, in other words, are not necessarily confined to occurrences involving the body, or to exchanges of words, gestures, tones, and expressions. These events can arise through other implicit, unspeaking, and tacit details that are "sensed" on some level, but that so readily escape the enumeration and articulation. Examples of such details can be found in the anecdotes provided throughout this dissertation: new books piled neatly on a desk, the tense silence of a computer lab, the confined space of an elevator, or the seat chosen by a student as he makes his way in to a crowded classroom.

All of these details point to a more general, shared experience of a particular place, time, appearance, or event. They contribute in some small way to a broader phenomenon that is perhaps best captured through terms such as "mood," "tone," "impression," or "ambience." In everyday language, the characteristics of these phenomena are commonly described in a wide range of ways: as cheery, grey, light,

heavy, somber, studious, oppressive, etc. Van Manen and others have chosen the term "atmosphere" to designate the phenomenon underlying such terms. In common usage, "atmosphere" tends to be used to refer to a "pervading tone or mood," or to "a characteristic mental or moral environment" (Oxford University Press, 1989). Using the terms "atmosphere" and "mood" interchangeably, van Manen emphasizes in all forms of experience:

> atmosphere is a profound part of our existence. By it we know the character of the world around us. Mood is a way of knowing and being in the world. . . .for each specific object or quality, atmosphere or mood is the way human beings experience the world. (1986, p. 31)

Of course, this phenomenon of mood or atmosphere is also manifest in specifically educational spaces and events. Bollnow identifies a particularly "pedagogical" manifestation of atmosphere, and defines it as follows:

> I take the term *pedagogical atmosphere* to mean all those fundamental emotional conditions and sentient human qualities that exist between the educator and the [student] and which form the basis for every pedagogical relationship. (1989, p. 5)

Like Levinas' notion of proximity, atmosphere--pedagogical or otherwise--can be characterized as something that is sensed or felt, rather than something that is known. Many of the myriad of elements that contribute to it remain below the level

of awareness, sensed only in a modality that has already been characterized as "non-the-matic." Atmosphere, then, is not simply the sum of a series of definable and quantifiable properties, conditions or elements. In this sense it is clearly distinguishable from the term "environment" as it tends to be used in the educational technology and instructional design literature--designating, for example, a software system, or an enumerable collection of behaviours, tasks and expectations (e.g. Koper, 2000, p. 8).

Atmosphere can also be described as a *unitary* phenomenon, one that cannot be divided spatially and temporally. Like the atmosphere that surrounds us physically, a figurative and pedagogical atmosphere is an emphatically local phenomenon, dependent on and defined by a particular time and place. It cannot be simultaneously apportioned to separate locations in space and time. For example, as van Manen says, the true character of a particular atmosphere may sometimes become most palpable at moments of silence in a class or among a gathering of people (1986, pp. 36-37). And such a silence, as mentioned earlier, cannot be experienced in the same, sententious way in online context where experience is divided temporally and spatially.

A further characteristic of atmosphere is that it cannot be made the subject of planning, control and calculation. Because the parts that together make up the greater "whole" that is atmosphere escape our notice, they naturally also escape our control. Atmosphere is thus not something that is objectively determined in the world around one: A person will not be necessarily happy simply because the sun is

shining, or because others are cheerful. At the same time, atmosphere is also not simply subjectively determined, and a question of somehow owning, controlling or balancing one's internal feelings or moods. It is a combination of the internal and external; and it is a combination in which incidental details such as new books piled neatly on a desk or a tense silence in a lab or classroom play a significant role. Like a personal relationship, atmosphere is something that comes into being, without being the outcome of an action or contribution taken individually or in isolation. Indeed, as Bollnow has already said, pedagogical atmosphere is an essential characteristic that forms "the basis for *every* pedagogical relationship" (emphasis mine).

Pedagogical Relation

As was shown in the introduction to this dissertation, the centrality of the pedagogical relationship is implicitly but consistently affirmed and reaffirmed in the literature of educational technology and distance education. Whether the computer and network are conceived as tutor, tutee, or as intellectual or dialogical partner, this technology is unvaryingly envisioned as entering into an intimate and personal relationship with the student. While the importance of this relationship is repeatedly--but perhaps unintentionally--underscored in this literature, its characteristics are only vaguely intimated.

However, the characteristics of what has been called the "pedagogical relation" *have* been described explicitly in pedagogical theory associated with the German *Geisteswissenschaften*. As van Manen explains, Herman Nohl, an important representative of this pedagogical tradition, describes this relation "as an 'intensely

experienced relation,' characterized by three aspects." First, this relation is "a very personal [one,] animated by a special quality that spontaneously emerges. . . that can neither be managed or trained, nor reduced to any other human interaction." Second, "the pedagogical relation is an intentional relation where in the intention of the teacher is always determined in a double direction:" towards who the student is, and who she will become. Third, Nohl stresses that "for the student the pedagogical relation with the educator is more than a means to an end. . . the relation is a life experience that has significance in and of itself" (van Manen, 1994, p. 143).

Nohl himself characterizes the pedagogical relation as being marked by a "two-sided" or "polarized" character: the teacher, Nohl says, is always aware of what the student is to become, but also always addresses her in terms of her current needs and situation (Nohl, 1949, p. 128). The pedagogical relation is also always a means to an identifiable end--the realization of particular goals and achievements--but it also has its "purpose. . . contained within itself" (Nohl, 1949, p. 127).

Nohl's characterizations--as well as those associated with the etymology of pedagogy --take the relationship between an adult and a *child* as paradigmatic of this educational relation. However, when the aspects of this relation are considered for adult learners or for students generally, many of these ambivalences and tensions remain: This is illustrated in the remarkable consistency with which concerns about a close and reciprocal relation between student and computer surface in the literature of educational technology. As illustrated in the introduction, a conception of such a relation appears and reappears in understandings of this technology as

tutor, tutee and as "mindtool," entering into a close relationship with the students, but affirming the student's ultimate control over this relationship. As a further example, the "guidance" invoked in Holmberg's oft-cited concept of "guided didactic conversation" is no less important or needed simply as a result of the age of the learner. Holmberg, at least, makes no such distinction.

However, questions of guidance, authority and autonomy in such a relationship are more complex than discussions of educational technology tend to make them out to be. For example, both hypertext and interactive "digital materials" are understood as giving the student the freedom to engage materials in a manner that is "more personally meaningful" or that makes the student "special" (Jonassen, 2000, p. 208; Papert, as cited in Tapscott, 1998, p. 146). But as this dissertation has shown, this is not accomplished through an arbitrary exercise of freedom in clicking hypertext links, or through the ready availability of feedback, calculated for the student on demand. The questions of authority and autonomy are instead much more properly addressed in a human relation characterized through the role and etymology associated with the word "pedagogy" itself: As described earlier, the pedagogue, like the slave taking the child to the agora, leads the student onwards to a destination. However, in doing so, the slave is also bound by his own role of service to the child--to the child's current situation and needs. This ambivalence is further underscored by the rich and varied meanings of the root *agein*--to lead. These meanings suggest that the freedom offered in the pedagogical relationship is not one of unrestricted choice and limitless convenience. Instead, as was indicated in the

discussion of print and hypertext media, this relation is one in which meaningful freedoms are achieved in the context of constraints and commitments.

Computer technologies, as indicated earlier, are separated from such concerns by an "ontological gap." Computers are incapable of entering into the world of commitment, freedom, constraint and meaning that is central to the pedagogical relationship--or in any other human relationship. Consequently, by their very nature, they cannot fulfill the educational promise that is so frequently ascribed to them. Simply by virtue of being computers, these devices cannot lead students down "their own personal paths to learning;" and they cannot participate in any didactic or other "dialog" that would resemble human conversation.

Pedagogy as a Focal Practice

As a local, unitary, and relational phenomenon, mediated through an "a-thematic" awareness, pedagogy bears close resemblance to what philosopher Albert Borgmann refers to as a "focal practice." As Borgmann explains, in using the term "focal," he draws both on its meaning in common English, in scientific language, and its origin in the Latin term for "hearth," "the symbolical center of the house:"

> Figuratively [these meanings] suggest that a focus gathers the relations of its context and radiates it into its surroundings and informs them. To focus on something or to bring it into focus is to make it central, clear and articulate. It is in the context of these historical and living senses of "focus" that I want to speak of focal things and practices. (1984, p. 197)

A focal practice, as Borgmann further explains, "provides a center of orientation" (1984, p. 197). "It is a final and dominant end," he says, "which alone truly matters and fulfills and which therefore assigns all other things and activities their rank and place" (1984, p. 211). He provides the examples of "music, gardening [and] the culture of the table" as instances of focal practices (1984, p. 197). As forms of pleasure and enjoyment, activities like eating a fine meal, enjoying a concert, or caring for a flower bed are not things that are undertaken as means to achieving a specific end. They are not done in a calculating manner or to satisfy ulterior motives, or with the hope of achieving a different goal or purpose. Instead, they constitute ends in themselves, and as such, these ends are able to lend meaning, purpose and order to other practices and activities. These other practices can then be organized and utilized to serve those practices that are "focal" in nature.

Elaborating on Borgmann's notion, Hubert and Stuart Dreyfus point to friendship and its cultivation as an illustration of a focal practice:

> People have a lot of practices for supporting their friends and abandoning their friends, but philosophy hasn't worked on it or tried to make principles about it and it hasn't become part of the efficient technological ordering of things. People have not gone around saying we should make friendship more efficient, more productive and so forth, so it exists as a kind of non-rationalized practice. (as quoted in Flyvbjerg, 1991, p. 97)

The Dreyfuses draw attention to the tendency of focal practices to resist rationalization or attempts to make them more efficient or productive. As ends in themselves, these practices are not activities that we try to eliminate, reduce or accelerate, as if to make time or opportunity for other ends or pleasures. Instead, we only seek to make *other* activities that are more efficient or less time consuming so that we may devote desired time and attention to those practices more "focal" in nature. In addition, the examples of friendship, the enjoyment of gardening and meal-time indicate that, as Borgmann points out, focal practices have a tendency to be "compact:" they are focused spatially in a particular physical location. He also warns that such practices should not be

> thought of as experiences in the subjective sense, events that have their real meaning in transporting a person into a certain mental or emotional state. Focal events, so conceived, fall under the rule of technology. For when a subjective state becomes decisive, the search for a machinery that is functionally equivalent to the traditional enactment of that state begins. (1984, p. 202)

These terms are remarkably similar to many of those used above to describe the phenomenon of atmosphere--or more specifically, of pedagogical atmosphere. Both "pedagogical atmosphere" and "focal practices" represent something that is neither simply a question of subjective mood, nor a matter of objective conditions that can be enumerated, controlled, or mechanically simulated. Moreover, both tend to be local or "compact" phenomena: Like a musical concert or a family meal, both focal

practices and pedagogical atmosphere tend to have an identifiable locale or literal center of focus: this focus is constituted by the concert hall, the supper table, or by the classroom or other physical place where a pedagogical relation is realized. Finally, like focal practices, education, too, is not reducible simply to questions of efficiency and rational organization. For example, like a friendship, the pedagogical relation described by Nohl has its "purpose contained within itself." Both ultimately find their fulfillment in themselves--despite the many rewards, goals and accomplishments that may be associated with them.

Support for an understanding of pedagogy as a non-rationalizable, focal practice, however, is not confined simply to pedagogical theory associated with the German *Geisteswissenschaften*. Hints, indications and remarkable correspondences can be found in the literature of educational technologies itself, and also in examinations of the history of these technologies. One general example is the "no significant difference phenomenon" discussed in the introduction to this dissertation. This phenomenon shows how decades of research in the use of educational technologies has failed to produce a discernable increase in measures of learning efficiency--specifically when compared to more traditional means and practices. This seems to suggest that the practices of pedagogy have resisted all manner of attempts to be addressed in terms of technological efficiency, and to realize significant increases in efficiency. A similar resistance to change on the part of pedagogical practices is also manifest in accounts of the history of educational technologies. Looking at one hundred years of history of technological change in American schools, Larry Cuban concludes that "shifts over the last century in classroom topography"--including its

"organization," "relationships," and "methods"--"barely can be detected." "What can hardly escape notice" Cuban observes further, is the survival and resilience of what he characterizes as a common, "persistent core of practices" (1986, p. 104).

Surprising admissions can also sometimes be found in the writings even of those who otherwise strongly advocate the use of educational technologies. In a remarkable article on "Certainty, determinism and predictability in theories of instructional design," Jonassen himself admits that

> We are ill-equipped to adequately describe human thinking, let alone regulate it. Knowledge is an elusive phenomenon. . . . While research in instructional systems has identified very few fairly reliable cause-effect relationships between instructional and activity and learning performance, whether they will be operable in any learning system is probabilistic at best. (1997, p. 28)

Jonassen's response to such limitations is to suggest even more rigorous and complicated structural and systems approaches--to represent the "elusive phenomenon" of knowledge, as he says, in even more "complex, interacting forms in the world as well as in the learner's head" (1997, pp. 28, 33).

As indicated earlier, the typical response to the remarkable resistance and resilience of "core" or "focal" educational practices is a redoubled appeal to the evolutionary or revolutionary force of technological progress--to end their stubborn persistence as

"low-tech institutions in a high-tech society" (Gerstner, as cited in Cuban, 2001, p. 13).

However, a different response to these remarkable results and this exceptional legacy is also possible. Van Manen suggests such an alternative response by saying that

> Maybe we should be *amazed* that pedagogical relations are maintained *in spite* of increasing technological rationalization of educational life in schools and other educational systems. . . [that] in spite of research into teaching, ever-changing philosophies of education. . . it seems that the actual reality of teaching and learning continues to defy effective rationalization. (2003, emphasis mine)

So perhaps the question researchers should be asking is not: "How can we search for yet more ways to try to make education more efficient?" but instead, "How are the practices of pedagogy so remarkably resistant to attempts to rationalize and make them more efficient?" In an attempt to provide an answer to such a question, van Manen suggests that the practices of education may be comparable to Michel Foucault's notions of "subjugated" or "marginal knowledges" or practices. Foucault, as van Manen explains,

> may provide a framework by suggesting that such [activity] constitutes marginalized practices that do not fall outside of rationalized domains but

> operate at the margins, within, and even against those technologically rational structures. In Foucault's terms, they form a kind of "local knowledge" that gets enacted in ever-unique, always-changing, particular situations of educational life in and out of classrooms. (2003)

Van Manen explains the possible correspondence of pedagogy to these local knowledges as follows:

> in everyday teaching-learning situations, the local knowledges that sustain pedagogical relations are not so much located at the margin but operate at the very centre of classroom life. In the accounts of many teachers, the informal life of teaching usually overflows the technical rationalizations in terms of which education is commonly framed. (2003)

So, the task incumbent on educators and educational researchers may not be to blindly pursue rationalization and efficiency, but to guard against the reduction of educational focal practices to simple rational procedures and technical knowledge. Instead of trying to reduce the ends of education to the methods and means of technical efficiency, it is important to see technical means only as supporting and sustaining more significant pedagogical ends.

Bringing Educational Technologies into Focus

Borgmann says of a focal practice that "when we bring the surrounding technology into it, our relations to technology become clarified and well-defined" (1984, p. 196).

Something like this should be possible in thinking of pedagogy as a focal practice. Seeing pedagogy as a focal practice may allow us to clarify the role of technology and put it in its place, without rejecting the contribution it can make to the ends of pedagogy. So as the term is used in this section, bringing technology into "focus" actually means moving it out of the focal center, and seeing how it relates to and supports focal practices that *are* central. By doing so, it will hopefully be possible to bring the value or potential of this technology into greater clarity.

When considered as a means of supporting focal practices, one of the characteristics of this technology that stands out is its *enframing* power. As explained in the introduction, these technologies "*enframe*" in the sense that they open up or set up certain experiential and intellectual opportunities or worlds, while imposing limitations on others. Computer and Internet technologies--like all modern technologies--make certain experiences, practices and meanings possible, while reducing the significance, purpose and practicality of others. One of the characteristics of this *enframing* that has come up indirectly at various points is that computers stake out, privilege and concretize the abstract, the formal, the theoretical and the mental. They make the "symbolic" "concrete," as David Bolter says (1984, pp. 71, 74).

Significantly, there are many contexts in which precisely this abstracting and formalizing power can make valuable contributions to pedagogical focal practices. An example is provided by the video segment or clip downloaded from the Internet, as described in chapter four. This video file explains the characteristics and

processes associated with DNA, using spoken explanation and computer-generated, abstract animations. In this case, it is the ability of computers to generate, transmit and display abstract images of DNA that constitutes their contribution to greater pedagogical ends. Significantly, these images and forms concretize complex structures that have no readily accessible or visible counterpart in the physical world. And it is the abstract, formal and structured phenomenon of DNA that constitutes the subject matter with which the student is to be directly engaged. The computer and network, in this context, are able to represent this formal structure in a manner that is explicit, public and accessible. Unlike the privacy of reading with which it is compared, the clip's description is available in a manifestly explicit and public form in all of its detail and specificity. It helps the student to "see" the process, to "believe" with others who have also viewed it.

However, this same abstracting and enframing power is less suitable or valuable in the context of other pedagogical practices or situations. An example is provided by the frog dissection--also described in the fourth chapter. The technologies of computer and network are used to present an accessible, visual representation of physical forms of a dissected frog. But unlike the animated images of DNA, these forms actually *do* have obvious counterparts in the physical world that are both visible and palpable. Networked digital technologies in this case do *not* present a world to the student that is one of formalisms or abstractions that would otherwise simply need to be imagined or visualized privately. Instead, these technologies supplant a palpable, physical form with one that is abstract and disembodied. In doing so, they foreground what has earlier been identified as a significant

ontological "difference" or "gap." The status of the virtual object these technologies present, understood simply as an entity in the world, is qualitatively different from the status of what it is supposed to represent. And this difference is of obvious pedagogical significance. It is precisely the discovery of the order and dynamics--as well as the variability--of natural, physical bodies that is an important part of dissection activity. Although a simulated dissection may allow the student to effectively rehearse the steps of a dissection in simplified and schematized form, it does not substitute for the physical experience in all of its pedagogically significant dimensions.

These two relatively simple illustrations of how computers and the Internet relate to the focal practices of pedagogy show that the enframing and formalizing power of this technology contributes to pedagogy in a way that is quite different from the way it tends to be understood by constructivists such as Jonassen. This power can be useful for learning *not* because all learning is itself simply a matter of constructing formalisms and "links between existing knowledge and new knowledge," as Jonassen claims (1993, p. 155). Instead, the examples above show how the formalizing power of this technology corresponds quite directly to the specific subject matter at hand. Given the dominance and value of such formalized and abstract models in our technological society, this particular pedagogical strength of the computer is likely to be of considerable and widespread importance.

In a similar manner, the potential of the computer's enframing power is revealed in its ability to assist in the composition, transmission and ready accessibility of written

words. Writing itself can be understood as a set of structures or formalisms that follow ordered rules of syntax and semantics (e.g. Sturrock, 1986). Combinations of the twenty-six characters of the Latin alphabet present a formal code that computers are clearly adept at transmitting displaying, manipulating, ordering and reordering. All of this can be put to use to assist in the realization of the repose, reflectiveness, precision and clarity associated with writing--as opposed to the expressive spontaneity that marks spoken exchanges. This potential is illustrated in the notes sent between a grade nine student and her teacher cited in the fifth chapter. In this instance, both individuals give nuanced descriptions to their mixed feelings toward one another, providing precise expression and qualification to thoughts and feelings. Such controlled, reflective, and deeply felt self-disclosure might indeed be very difficult to realize without the exchange of a-synchronous, written messages.

At the same time, however, the contribution made by technologies supporting the composition, transmission and organization of writing to pedagogical practices is marked by significant limitations. These can be understood most clearly in terms of the characteristics of pedagogical atmosphere and focal practices described earlier. For example, the fact that students in online forums are not required to share a common "present" or "place" runs counter to the "compact" nature of focal practices generally. In addition, the local and intrinsic particularity of pedagogical atmosphere seems to be something that is difficult to foster in such forms that have been freed from spatial and temporal constraints. The very fact that these online forums accommodate careful reflection and controlled verbal construction also reflects restrictions that these technologies place on the pre-intentional, a-thematic

aspects of relations. And it is precisely these relational subtleties that are indispensable for what van Manen identifies as "tact" and "pedagogical tact." Indeed, as the example provided in the fourth chapter of this dissertation shows, the potential of written, a-synchronous communication is very effectively realized when used in the context of a local, compact, and physical setting--augmenting or offsetting these aspects of pedagogical focal practice, but not operating in isolation from them.

It is important that in all of the examples discussed above, the contribution of networked technologies to focal pedagogical practices is understood very specifically in terms of the particularities and details of these practices. In discussing the contributions represented by the dissection and DNA video animation, for example, it is the *details* of the ontological status of the subject matter that are decisive in understanding and evaluating the contribution of this technology. Similarly, the reflection, restraint and precision for which writing allows, and which networked technology further enhances, become valuable in the specific and intimate pedagogical relations between students and teachers. All of this points to the fact that the role and contribution of these technologies to pedagogical focal practices is best understood not in terms of "education," "learning," "interaction" or any other overarching, abstract category. Correspondingly, there is no one generic, all encompassing role or position that these technologies will be able to fulfill in making their contribution to pedagogical practices. Instead, the type of contribution, and the way it becomes manifest varies from particular moments, forms and events in the focal practices of pedagogy. This is again something that runs contrary to the

enframing, abstracting and homogenizing power of computer technologies themselves--and to the abstract and general categories already prevalent in educational technology and curricular theories. It is only by resisting these aspects of the enframing power of computers that the real contributions of these technologies to pedagogical practices can come into focus. And it is only in this way that we can ensure that technology serves our ends and purposes, rather than our serving it.

Conclusion

The question that I have set out to answer in this dissertation was originally formulated in its introduction: "What is the pedagogical significance of the relation between students and networked technology?"

In endeavoring to answer this question, I have found that computers and the Internet can indeed stake out places suitable for pedagogy, but that their capability to do so is limited by a number of factors. First, the ability of these technologies to contribute to the practices and the guiding relation at the focus of pedagogy is inherently limited by the very nature of these technologies. The entities, objects and even pre-programmed words that these technologies present to students are disembodied and abstracted; and these disembodied entities are separated from their counterparts in the physical and human worlds by a qualitative, ontological gap. As a result, the pedagogical benefits that can be gained from their simulation and imitation are by their very nature restricted. Also, the capacity of these technologies to contribute to focal practices through their power to display, transmit and allow the manipulation of language is also limited. This limitation can be described in terms of the attenuation of pre-intentional a-thematic awareness, and the limitations imposed on qualities of pedagogical atmosphere and tact with which this awareness is closely associated.

Finally, in considering the pedagogical significance of the relation of students to this technology, it is important to emphasize that its pedagogical potential is also

significantly limited simply by the way that this technology is understood or misunderstood in the educational literature in which it is discussed. It tends not to be analyzed in qualitative, historical and critical terms, nor in terms of the variability, particularity and specificity of pedagogical contexts. Consequently, in concluding this study, I propose the following thesis statements and assertions for research and practice in the area of educational technologies:

- That the role and contribution of technologies to pedagogical practices be considered in terms of those factors and particularities that limit abstract generalizability of findings.

- That the uncritical application of terms proper to these technologies to human engagement with them (e.g. mental processing, degrees of interactivity) be resisted. Instead, terms more reflective of experiential characteristics of the *users* of these technologies should be used (e.g. reflective thinking, degrees of immersion or engagement).

- That the terms used to designate networked technologies in educational contexts (e.g. discussion forums, virtual labs) be subject to critical scrutiny. Where appropriate, terms that orient students and instructors more directly to the characteristics of these technologies should be suggested.

- That engagement with these technologies be studied in terms *other* than their contribution to educational efficiency. Repeated investigations of networked

technologies using these terms of reference have been inconclusive or unproductive.

- That the core or focal practices of education be subject to research in terms of their longevity and adaptability to new technological forms and social priorities,. In much of the literature, these practices are discussed only in terms that foreground their antiquated character and their irrational resistance to technological change and rationalization.

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